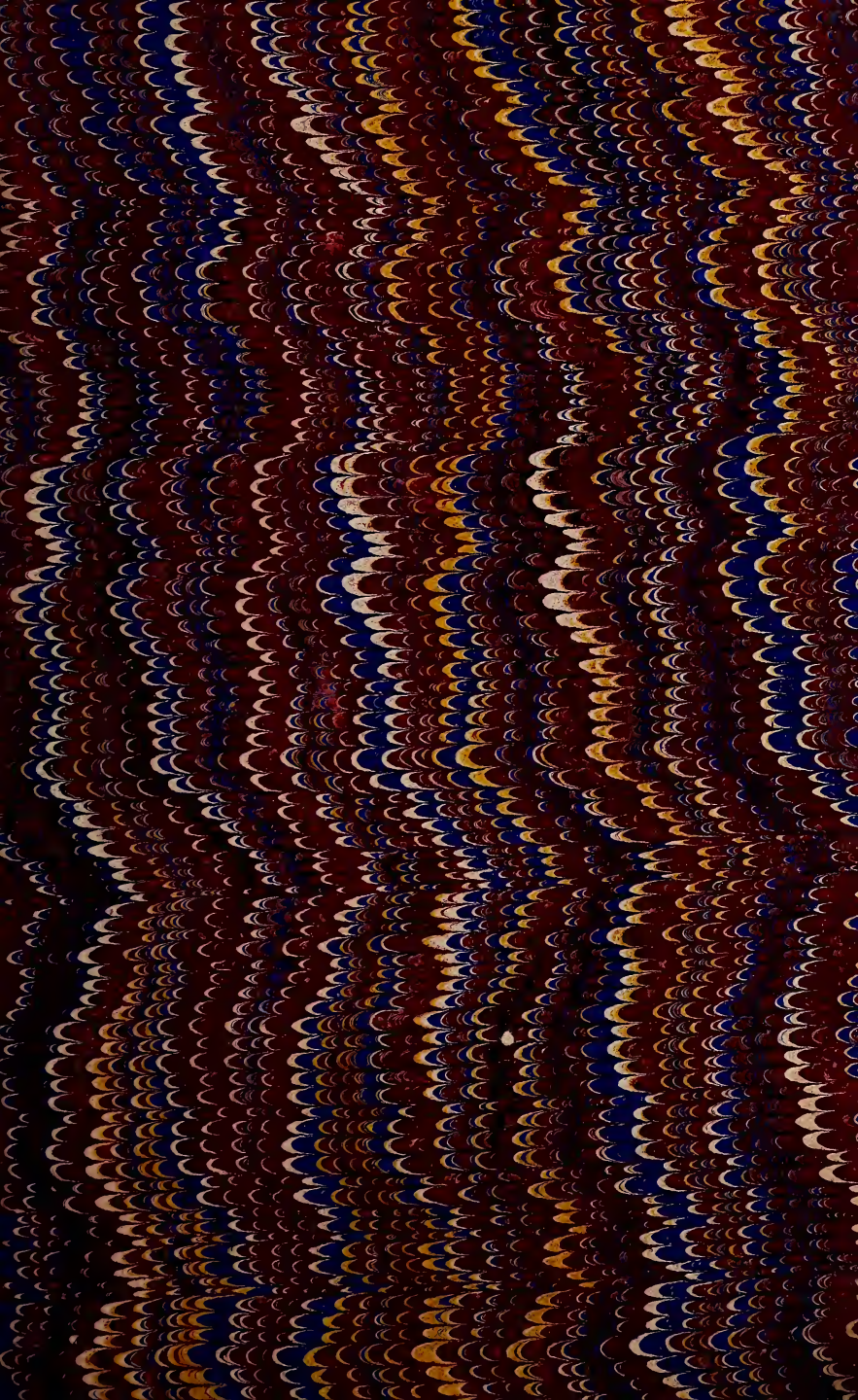


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INDEX  
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## INDEX OF SUBJECTS.

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
A.			
ABYSSINIA .. .. .	Parkyns, Mans- field	XII 51 506	1868
"ACHILLES," H.M.S., Inglefield's New Hydraulic Steering Apparatus, as being fitted to, <i>with plate</i>	Inglefield, E. A., Captain R.N.	XIII 53 22	1869
—— Means of Screw-Ship Steerage, and a Description of the Hydrostatic Steering Gear fitted on board, with the Results of Experiments at Sea ; also a Plan of Apparatus fitted on board the Turkish Ironclad "Fethi- Bulend," <i>with plate</i>	„ E. A., Rear-Admiral	XIV 57 52	1870
AFRICA, The Best Mode of Defence of the Protected Territories on the Gold Coast of, and the Organization of a Force Sufficient for that Purpose, <i>with map</i>	Lauderdale, Adm. the Earl of, G.C.B.	XVII 74 676	1873
"AGINCOURT," H.M. Ship, on and off the Pearl Rock, <i>with plates</i>	Boyle, R. H., Com- mander R.N.	XVI 67 189	1872
AIKMAN'S Instruction-Rifle and Prac- tice-Tester for Ordnance, <i>with plate</i>	Aikman, F. R., Lt.-Col., <b>G.C.</b>	XV 65A 847	1871
AMBULANCES, A Visit to Some of the, and Battle Fields of the North of France	Mouat, F. J., Sur- geon-Maj., M.D.	XV 64 459	1871
AMERICAN Navy, its Organization, Ships, Armament, and Recent Experiences, <i>with plates</i>	Hamilton, J. Ran- dolph	XII 49 243	1868
AMMUNITION-Supply Car, Skeleton Am- munition Car, Packing Ammunition, &c., <i>with plates</i>	Martin, T., Lieut.- Col. (late 4th Regiment)	XIII 55 337	1869
ANCIENT Naval Tactics, <i>with plates</i> ..	Warre, the Rev. Edmond, M.A.	XX 88 593	1876
ANEROID Barometer, An Occasional Note on the Use of, in Surveying	Fawcett, R. H., Capt. 33rd Regt.	XVI 66 143	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
ANIMALS, Minute Sea Surface, Delineation of some (Coloured Drawings), Part I.	Toynbee, Mrs. ..	Vol. No. P. XIX 80 214	1875
———— " " " II.	" "	XIX 81 377	1875
———— " " " III.	" "	XIX 82 531	1875
———— " " " IV.	" "	XIX 83 657	1875
APPARATUS for automatically Recording the Rolling of a ship in a Sea-way, <i>see Rolling.</i>		.	
APPENDICES.*			
ARMADA, Spanish, A Warning Voice from..	Collinson, T. B. Maj.-Gen. R.E.	XIX 81 285	1875
ARMED Strength of Europe.. .. .	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	XIX 83 549	1875
ARMIES, Foreign, the Practical Instruction of Staff Officers in	Burnaby, F. G., Capt. Roy. Horse Guards	XVI 68 633	1872
———— of different Nations, the Comparative Cost of, and the loss to a Country by Conscription	Ardagh, J. C., Capt. R.E.	XX 86 218	1876
ARMOUR-CLADS, Firing at, reduced to a System, <i>with plate</i>	Orde-Browne, C., Capt. late R.A.	XVI 69 684	1872
ARMOUR (Deflecting) Plated Ships for Coast Defence, <i>with plate</i>	Hyde, J. M. ..	XIII 53 128	1869
ARMoured Turret Ships, The Conversion of our Screw Line of Battle Ships into, <i>with plates</i>	Henwood, Charles F.	XIII 54 181	1869
ARMOUR-PLATED Ship, Description of a Model of, designed by him, <i>with illustrations</i>	Wilson, Edmund, Capt. R.N.	XII 51 502	1868
ARMS of Precision, New, The Amount of Advantage they give to the Defence over the Attack	Schaw, H., Capt. R.E.	XIV 59 377	1870
———— of Precision, How far the Employment of Cavalry is Affected by Recent Improvements in	Smith, Michael W., Maj.-Gen., C.B.	XII 49 147	1868

\* To each Volume of the Journal, there is an Appendix containing the Proceedings of the Annual General Meetings, Additions to the Library and Museum, and every second year a List of Members.—Ed.



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
ARMS, Small, Breech-Loading, the Progress of, <i>with plates</i>	Latham, John ..	Vol. No. P. XIX 83 631	1875
—— Small, Breech-Loading, Cartridges for, and the Best Form of Projectile, <i>with plate</i>	O'Hea, J. B., Capt. late 25th Regt.	XII 48 105	1868
—— Small, Military Breech-Loading, <i>with plate</i>	Majendie, V. D., Capt. R.A.	XI 44 190	1867
ARMY Administration, Reforms in. . .	De Fonblanque, H. B., Dep. C-G.	XIII 53 88	1869
—— a Proposition for one General Military School for	Collinson, Col. T. Bernard, R.E.	XIII 54 241	1869
—— British, The Cultivation of Scientific Knowledge by Regimental Officers of	Ross, Major W.H., late R.A.	XVI 69 774	1872
—— Chinese, The Economy of, <i>with illustrations</i>	Lamprey, J., M.B., Surgeon 67th Regiment	XI 46 403	1867
—— Construction of Boots and Shoes Suitable for the, Police, and others subject to Severe Walking, <i>with plate</i>	Howlett, Samuel B.	XII 48 44	1868
—— German, The Medical Department of, in Peace and War	Fox, T. W., Sur- geon-Gen. R.E.	XX 87 560	1876
—— Night Telegraph—The Spakowsky Marine	Doty, H. H., Capt.	XI 47 658	1867
—— of England, an Organization for ..	Bevan - Edwards, G., Major R.E.	XII 50 295	1868
—— On the Best Practical Method for Ensuring Efficiency in, and for Obtaining an Effective and Reliable Reserve, having Regard to the Existing Feeling in the Country on the Subject	Warde, Sir Edward C., K.C., Major- General, R.A.	XIX 80 128	1875
—— On the Organization of the Communications of, including Railways	Home, Lieut.-Col., C.B., R.E.	XIX 82 381	1875
—— Organization: our Infantry Forces and Infantry Reserves	Leahy, Arthur, Major R.E.	XII 50 310	1868
—— Suggestions for the Land Transport Service	Beazley, G. G., Capt. 83rd Regt.	XIII 56 564	1869
ARMY, the, The Best Mode for Recruiting for, and the Influences bearing upon that Service	Noake, R.C., Capt. Adjutant Scottish Borderers Militia	XI 43 27	1867

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
ARMY, the, The Dress and Equipment of, <i>with plate</i>	Walker, Arthur, Capt.	Vol. No. P. XI 45 375	1867
—— The Education of, with Reference to Young Officers	Middleton, F. D., Lt.-Col.	xv 65 686	1871
—— The Italian, <i>with plan</i> .. ..	Waveney, Col. Lord,	xx 86 359	1876
—— The Russian .. ..	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	xvi 67 265	1872
—— Prussian, A Brief Sketch of the System of Officering	„ „	xvi 69 796	1872
—— The Austrian. . . . .	„ „	xvii 73 527	1873
—— The Study of Military History by the Regimental Officers of, <i>with map and plates</i>	Hale, Lonsdale A., Maj. R.E.	xx 87 508	1876
ARTILLERY and Troops, Moveable Steel Mantlet for the Protection of, <i>with plate</i>	Eddy, Charles B., M.A.	xiii 55 326	1869
—— Field, on the Connected System, <i>with plate</i>	Ross, W. H., Maj. R.A.	xii 48 72	1868
—— Fire in Peace Manœuvres, <i>with diagrams</i>	Carmichael, L. M., Capt. 5th Royal Irish Lancers	xviii 78 449	1874
—— Modern, as exhibited at Paris in 1867, <i>with plates</i>	Owen, C. H., Lieut.-Col. R.A.	xii 48 90	1868
—— of the Advanced Guard of an Army in the Field, the Constitution and Duties of—(The R. A. Institution Prize Essay of 1874)	Pratt, S. C., Lieut. R.A.	xviii 79 489	1874
—— Practical, <i>with plates</i> .. ..	Strange, T. B., Capt. R.A.	xv 63 119	1871
—— Practice, Expanding Sponge for, <i>with plate</i>	Gilmore, A. H., Lieut. R.N.	xiii 53 30	1869
—— The Modes of Determining the Accuracy of, <i>with diagrams</i>	Pole, Professor W.	xi 43 1	1867
—— the Tactical Power of Modern Field	Brackenbury, C. B., Lt.-Col. R.A.	xx 86 310	1876
ASHANTEE Campaign — H.M.S. “Victor Emanuel” as an Hospital Ship during the late, <i>with plate</i>	Ryder, A. P., Vice-Admiral	xviii 78 383	1874

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
ASHANTI Campaign, The Volta Expedition, <i>with map</i>	Glover, Sir John H., G.C.M.G., Capt. R.N.	Vol. No. P. XVIII 78 317	1874
—— Expedition of 1873 .. .. .	Wood, Evelyn, Col., <i>V.C.</i> , C.B., 90th Regiment	XVIII 78 331	1874
ASIA in Europe, and a Sketch of the Russo-Turkish Campaigns of 1828-29, <i>with maps</i>	Wilbraham, Sir Richard, Lieut.-General, K.C.B.	XX 88 692	1876
—— Central, The Strategy of Russia in, from a Persian Point of View, <i>with map</i>	Smith, R. Murdoch, Capt. R.E.	XVII 71 212	1873
ASIAN (Central) Question, <i>with map</i> ..	Trench, F. Chenevix, Capt. 20th Hussars	XVII 71 184	1873
ATLANTIC, The Winds of the North, <i>with plates</i>	Toynbee, H., Capt.	XV 64 567	1871
—— The Meteorology, Sea Temperature, and Currents of the 10° square of the, which lies between the Equator and 10° N., and from 20° to 30° W., <i>with plates</i>	„ „	XVII 72 331	1873
ATTACK in Skirmishing Line, Proposed Method of, <i>with diagrams</i>	Parker, F. G. S. Capt. 54th Regt.	XVII 74 741	1873
—— Proposed Formation of a Battalion for the, <i>with plate</i>	Bigge, T. S., Major 5th Fusiliers	XVIII 76 152	1874
AUSTRIAN Army .. .. .	Vincent C. E. H. Lt. 23 R.W.F.	XVII 73 527	1873
—— in 1875 .. .. .	Graham, Sir Lumley, Bart., Col.	XX 87 543	1876
—— Confidential Report, and New Method of Promotion	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	XVI 66 151	1872
AUTUMN Manœuvres of Continental Armies, Military Maxims Suggested or Exemplified by the last, <i>with plans</i>	Shute, C. Cameron, Col., C.B.	XIV 58 206	1870
—— Manœuvres abroad and at home ..	Codrington, Sir William J., General G.C.B.	XVI 68 497	1872
—— Manœuvres of England .. .. .	Brackenbury, C. B., Capt. R.A.	XVI 67 222	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
AUTUMN Manœuvres of 1872 .. ..	Brackenbury, C.B., Capt. R.A.	Vol. No. P. XVII 71 73	1873
——— Manœuvres of the Prussian Guard Corps in September, 1872, <i>with plates</i>	Hildyard, H., Lieut. 72nd High- landers	XVI 69 781	1872
AZIMUTH Tables, Croudace's New Book of Stellar, and a Newly-Invented Il- luminated Stellar Azimuth Compass, Croudace's Ordnance Night-Sight Vane or Collimator	Croudace, W. S.	XVIII 77 265	1874
B.			
BARBETTE System, Further Particulars re- garding Moncrieff's Protected, <i>with plates</i>	Moncrieff, A., Capt. Edinburgh Artillery Militia	XI 44 241	1867
BAROMETER, Aneroid, An Occasional Note on the Use of, in Surveying	Fawcett, R. H., Capt. 33rd Regt.	XVI 66 143	1872
BARRACKS, Suggested Improvements in Sanitary Arrangements of Hospitals, Camps, and Shipping, &c.	Synge, Millington, Major-Gen. R.E.	XVIII 78 299	1874
BATTLE of Königgratz, <i>with maps</i> .. ..	Walker, Beau- champ, Col., C.B.	XII 51 440	1868
——— of Worth .. ..	Collen, E. H. H., Lt. R.A.	XVII 73 426	1873
BED or Mattress, Life-Saving .. ..	Smith, Henry ..	XIII 54 216	1869
BEDSTEAD, The Chobham, <i>with illustration</i>	Dillon, Conrad A., Capt.	XVI 66 56	1872
BESSEMER Saloon, A Proposed Method of Mounting Heavy Ordnance at Sea on the Principle of	Strange, Alex., Lt.- Col.	XVII 75 836	1873
BINNACLE Lights, Nunn's Improved, <i>with plate</i>	Colomb, P. H., Comr. R.N.	XII 49 272	1868
BISCUIT and other Farinaceous Articles of Diet in H.M. Navy, The Preservation of, from Weevil, Maggots, and other Insects, <i>with illustrations</i>	Seecombe, E.	XIX 83 681	1875
BOAT Lowering and Self-Detaching Appa- ratus, Hill's, <i>with plate</i>	Hill, E. J. ..	XVI 69 762	1872
BOATS, Lowering, at Sea, <i>with plate</i> ..	Lacon, W. Stirling	XVII 71 97	1873
——— Quarter, Plan of Sustaining and Lowering Ships', <i>with plates</i>	Simpson, C. H., Capt. R.N.	XI 47 519	1867

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
BOATS, On Improvements in Apparatus for Lowering and Raising, Engaging and Disengaging Ships', <i>with plate</i>	Folkard, A., M.I.C.E.	Vol. No. P. XVIII 77 278	1874
BOLTON and Colomb's Signal Lights, <i>with illustrations</i>	Colomb, P. H., Comr. R.N.	XII 50 373	1868
Boor, Military, Parker-Rhode's .. ..	Parker-Rhodes, C. E.	XVI 69 764	1872
BOOTS and Shoes Suitable for the Army, Police, and others subject to Severe Walking, Construction of	Howlett, Samuel B.	XII 48 44	1868
Bow and Stern Screw Steamships, <i>with diagram</i>	Griffiths, R., C.E.	XVII 74 734	1873
Boys—On Training them for Soldiers ..	Macgregor, John, M.A.	XIX 82 399	1875
BREECH-LOADERS, with Reference to Calibre, Supply, and Cost of Ammunition, <i>with plate</i>	Selwyn, J.H., Capt. R.N.	XI 43 15	1867
BREECH-LOADING and Muzzle-Loading for Guns, <i>with illustrations</i>	Morgan, J. P., Major R. A.	XVIII 78 408	1874
—— Cannon, Stuart's, <i>with plate</i> ..	Stuart, Graham, Capt. 4th W. Y. Artil. Volunteers	XIV 57 19	1870
—— Gun, Heavy, A Proposal for one of Novel Construction, <i>with plates</i>	Morgan, J.P., Capt. R.A.	XIV 60 479	1870
—— Small Arms, Cartridges for, and the best form of Projectile, <i>with plate</i>	O'Hea, J.B., Capt. late 25th Regt.	XII 48 105	1868
—— Small Arms, Military, <i>with plates</i>	Majendie, V. D., Capt. R.A.	XI 44 190	1867
—— Small Arms, The Progress of, <i>with plate</i>	Latham, John,	XIX 83 631	1875
BREMNER'S Steam Steering Screw, <i>with illustration</i>	Bremner, Geo., Capt.	XVII 70 69	1873
BRIDGE (Military) Construction, <i>with plates</i>	Leahy, Arthur, Lieut.-Col. R.E.	XIX 84 689	1875
BROADSIDE and End-on System, Combined, <i>with plates</i>	Symonds, T. E., Capt. R.N.	XI 46 485	1867
—— System, The Turret <i>versus</i> the, <i>with plates</i>	Coles, Cowper P., Capt. R.N., C.B.	XI 46 434	1867



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
BROADSIDE, Working Heavy Guns on the, with some Observations on the All-Round Fire, combined with the Broad-side System of Armament, <i>with plate</i>	Wilson, Edmund, Capt. R.N.	Vol. No. P. XIII. 53 110	1869
"BRUISER," H.M.S., On the Casing of the Propeller of, <i>with plate</i>	Griffiths, R., C.E.	xx 86 171	1876
BULLETS, Explosive, and their Application to Military purposes, <i>with plate</i>	Fosbery, G. V., Maj. V.C., H.M. Berghal Staff Corps	xii 48 16	1868
BURMAH, Upper, its Defences and War-like Resources, <i>with map</i>	Browne, Edmond, Capt. 21st Royal N. B. Fus.	xix 83 588	1875
C.			
CABLES, the Atlantic Telegraph of 1857-58, also those of 1865-66	Moriarty, H. A., Staff-Commander, C.B., R.N.	xi 44 127	1867
CAITHNESS'S, the Earl of, Gravitating Compass, and Nunn's Improved Binnacle Lights, <i>with illustration</i>	Colomb, P. H., Comr. R.N.	xii 49 272	1868
CAMPAIGN of 1870-71, &c.—(Notice of Work)	Lohlein, Ludwig, late Captain 1st Baden Body Guard Grenadier Regt.	xx 88 762	1876
—— Manteuffel's, in the East of France, <i>with map</i>	Gun, H. A., Capt. R.E.	xvii 72 268	1873
CAMPAIGNS of 1828-29 in Europe and Asia, a Sketch of the Russo-Turkish, <i>with maps</i>	Wilbraham, Sir Richard, Lieut.-General, K.C.B.	xx 88 692	1876
CAMPAIGN (The Last), of Hanover, <i>with maps</i>	Brackenbury, H., Capt. R.A.	xiv 58 255	1870
—— the late Russian, against Khiva, <i>with map</i>	Trench, F. Chenevix, 20th Huss.	xviii 77 212	1874
—— The Umbeyla, <i>with plate</i> .. ..	Fosbery, G. V., Major, V. C., H.M. Bengal Staff Corps	xi 47 548	1867
—— (The Winter) of Le Mans, <i>with maps</i>	Brackenbury, C.B., Capt. R.A.	xv 64 580	1871
CAMPBELL'S Range-Indicator, <i>with plate</i> ..	Campbell, J. R., Capt. Hants Militia Artillery	xvi 67 309	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
CAMPBELL'S Range-Indicator. ERRATUM ditto ditto	Campbell, J. R., Capt. Hants Militia Artillery	Vol. No. P. XVI 68 644	1872
CAMPING and Moving of Troops in Tropical Regions,—Sanitary Precautions to be observed, &c.	Maclean, W. C., M.D., C.B., Surgeon-General	XVIII 76 114	1874
CANADA, Dominion of, Report of a Reconnaissance of the North-West Provinces and Indian Territories of, and Narrative of a Journey Across the Continent through Canadian Territory to British Columbia and Vancouver's Island, <i>with map</i>	Robertson - Ross, P., Colonel	XVII 74 543	1873
CANNON, Stuart's Breech-Loading, <i>with plate</i>	Stuart, Graham, Capt. 4th W. Y. Artil. Volunteers	XIV 57 19	1870
"CAPTAIN," On the Causes of the Insufficient Stability of H. M.'s late Turret Ship, and of other Ironclads, <i>with plates</i>	Fishbourne, E. Gardiner, Rear-Admiral, C.B.	XV 62 1	1871
CARTRIDGES for Breech-Loading Small Arms, and the Best Form of Projectile, <i>with plate</i>	O'Hea, J.B., Capt., late 25th Regt.	XII 48 105	1868
CAUCASUS, The Eastern, and Daghestan, <i>with map</i>	Cunynghame, Sir A., Gen., K.C.B.	XVII 75 749	1873
CAVALRY—How far its Employment is Affected by Recent Improvements in Arms of Precision	Smith, Michael W., Maj.-Gen. C.B.	XII 49 147	1868
—— Organization and Employment of, with Discussion on ditto	Baker, Valentine, Col., late 10th Hussars	XVII 73 375	1873
—— Regiments about to take part in the Exercises of the Combined Cavalry Division Detailed from Regiments, translated by Major-General Walker, C.B., Instructions for — (Notice of Book)	Von Schmidt, Maj.-Gen., translated by Maj.-Gen. B. Walker, C.B.	XX 86 422	1876
—— the Employment of, in War ..	Hozier, H. M., Capt.	XVI 67 168	1872
—— <i>with plates</i> .. .. .	Russell, Frank S., Major 14th Hus.	XX 86 179	1876
CENTRAL Asian Question—The Euphrates Valley Route to India, in connection with, <i>with map</i>	Andrew, W. P.	XVII 73 472	1873

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
CENTRAL Asian Question, The, <i>with map</i> ..	Trench, F. Chenevix, Capt. 20th Huss.	Vol. No. P. XVII 71 184	1873
— Asia, the Military Geography of, <i>with maps</i>	Baker, Valentine, Col., late 10th Hussars	XVIII 79 453	1874
— Asia, the Strategy of Russia in, from a Persian Point of View, <i>with map</i>	Smith, R. Murdoch, Capt. R.E.	XVII 71 212	1873
"CHALLENGER," H.M.S., The Voyage of, <i>with map and diagrams</i>	Carpenter, William, M.D.	XVII 75 813	1873
"CHALLENGER," H.M.S., The Voyage of, continued, <i>with diagrams</i>	" "	XIX 84 741	1875
— The, Extracts from a Paper read at the British Association for the Advancement of Science, at Bradford, on the Scientific Voyage of, <i>with map</i>	Davis, J. E., Capt. R.N.	XVII 75 828	1873
CHINESE Army, the Economy of, <i>with illustrations</i>	Lamprey, J., M.B., F.R.G.S., Surgeon 67th Regiment	XI 46 403	1867
— Naval Arsenal at Foo-chow, an Account of, translated and abridged from M. Giquel's Pamphlet	Bridge, Cyprian A. G., Comr. R.N.	XX 88 711	1876
CHITTAGONG Column of the Lushaie Expeditionary Force, 1871-72, an Account of the Proceedings of, <i>with map</i>	East, C. J., Brevet-Major 41st Regt.	XVII 71 113	1873
— Torpedo, Description of a Model of	Beal, Rev. S., R.N.	XV 65 728	1871
CIRCULAR Ironclads, <i>with plates</i>	Reed, E. J., C.B., M.P.	XX 85 85	1876
— Ships of War, <i>see Ships of War.</i>			
COAL, Economy of, as viewed by the Commander of a Steam Vessel	Shortland, P. F., Capt. R.N.	XVIII 76 2	1874
COALS, Methods of ascertaining the Relative Value of, for Naval Purposes, <i>with illustrations</i>	Eckersley, E., Chief Engineer, R.N.	XIX 84 723	1875
COAST Defences, and the Application of Iron to Fortifications, <i>with plate</i>	Jervois, Col., C.B., R.E.	XII 52 548	1868
— Fog Signals, <i>see Fog Signals.</i>			

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
COAST Defence, Deflecting Armour-Plated Ships for, <i>with plate</i>	Hyde, J. M. ..	Vol. No. P. XIII 53 128	1869
COLLIMATOR, The Use of, for Laying Guns for Night Firing, <i>with plate</i>	Davidson, D., Lieut.-Col.	XIII 55 386	1869
COLLISION, &c., in Cases of, The Naval Hammock, its Buoyancy and Use in Saving Life at Sea	Ryder, A.P., Rear-Admiral	XV 62 111	1871
COLLISIONS at Sea, Helm Indicator for the Prevention of, <i>with illustrations</i>	Read, George, R.N.	XII 48 141	1868
——— Read and Nicholl's Patent Day and Night Helm Signals for Preventing, <i>with plate</i>	„ „	XVI 69 749	1872
——— On the best Method of Propelling Steam Ships, so as to give the Greatest Facility for Manœuvring in Action, and for Avoiding Collisions, <i>with plate</i>	Griffiths, R., C.E.	XX 88 684	1876
COLOMB, Captain, Signal Lights of, and of Captain Bolton, <i>with plate</i>	Colomb, P. H., Comr. R.N.	XII 50 373	1868
COMMISSION, Permanent, the Necessity for, on State Scientific Questions	Strange, Alex., Lt.-Col.	XV 64 537	1871
COMPANY, The, as a Military Body; its Establishment, and the Best Number of Companies in the Battalion	Graham, Sir Lumley, Bart., Col.	XIX 83 567	1875
COMPASS, Description of a Registering, <i>with illustration</i>	Arthur, Capt., R.N.	XIV 61 567	1870
COMPASSES, The Demagnetization of Iron Ships and of Iron Beams, &c., of Wooden Vessels, to prevent the Deviation of, Experimentally shown by means of a Model, <i>with plate</i>	Hopkins, Evan, C.E.	XI 44 260	1867
CONICAL Screw and Breech-Loading Cannon, Steenstrûp's, <i>with illustration</i>	Jensen, Peter	XIV 57 124	1870
CONSCRIPTION, Universal, the only Answer to the Recruiting Question.—(The Institution's Military Prize Essay, 1875)	Hime, H. W. L., Capt. R.A.	XIX 80 92	1875
CONTROL Service, The, with Practical Suggestions for its Improvement, &c.	De Fonblanque, E. B., Dep. C.-G.	XVI 66 105	1872
CONVENTION, The Geneva, of 1864, in Relation to aid afforded by Volunteer Societies to Sick and Wounded Soldiers during the late Franco-Prussian War, &c.	Longmore, T., C.B., M.D., Dep. Insp.-Gen. Hospitals	XVI 67 206	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
COOKING Apparatus, Self-Acting, Sörensen's Norwegian, <i>with illustrations</i>	Sörensen, John ..	Vol. No. P. XII 49 292	1868
——— for Troops, <i>with illustrations</i> ..	Warren, Frederick, Comr. R.N.	XII 49 275	1868
COST, Comparative, of the Armies of different Nations, and the loss to a Country by Conscription	Ardagh, J.C., Capt. R.E.	XX 86 218	1876
CROUDACE'S New Book of Stellar Azimuth Tables, and on a Newly-Invented Illuminated Stellar Azimuth Compass, Croudace's Ordnance Night-sight Vane or Collimator	Croudace, W. S.	XVIII 77 265	1874
CURRENTS, Ocean .. .. .	Laughton, J. K., R.N.	xv 65 663	1871
——— Ocean, and their Influences, <i>with maps</i>	Findlay, A. G.	xiv 58 133	1870
<b>D.</b>			
DAGHESTAN and the Eastern Caucasus, <i>with map</i>	Cunynghame, Sir A., Gen., K.C.B.	xvii 75 749	1873
DECK-RAFTS for Saving Life at Sea, and a System of Improved Life-Buoys, <i>with illustration</i>	Hamilton, Mark, M.D., Surgeon R.N.	xvii 74 725	1873
DEFENCE, Harbour .. .. .	Moncrieff, Alexan- der, Major	xix 81 357	1875
——— Maritime, of England, including Offensive and Defensive Warfare:— Part I. The Organization of our Maritime Forces. Part II. Our Ships of War and their Armament, &c., <i>with plates</i>	Scott, R. A. E., Capt. R.N.	xx 87 447	1876
——— of England, Observation on the ..	Soady, F.J., Lieut.- Col. R.A.	xiv 61 570	1870
——— of Paris, The New Works for, <i>with map</i>	Tyler, E.S., Major R.E.	xix 80 74	1875
DEFENCES, Coast, and the Application of Iron to Fortifications, <i>with plates</i>	Jervois, Col., C.B., R.E.	xii 52 548	1868
DEFENCES, National, of Great Britain, Especially with Reference to the Future Requirement of Floating Forts, <i>with plate</i>	Mackie, Samuel J., Assoc. Inst. C.E.	xii 49 222	1868



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
DEFENCE, The Amount of Advantage which the new Arms of Precision give to the, over the Attack	Schaw, H., Capt. R.E.	Vol. No. P. XIV 59 377	1870
—— The Position and Lines of the 5th Corps before Versailles during the Winter of 1870-71, <i>with map</i>	Walker, Beau- champ, Maj.-Gen., Mil. Attaché, Berlin	xv 65 806	1871
DEFENSIVE Submarine Warfare, <i>with plate</i>	Stotherd, R. H., Major R.E.	xv 65 705	1871
DEFLECTING Armour-Plated Ships for Coast Defence, <i>with plate</i>	Hyde, J. M. ..	xiii 53 128	1869
DEMAGNETIZATION of Iron Ships and of Iron Beams, &c., of Wooden Vessels, to Prevent the Deviation of the Compasses, experimentally shown by means of a Model, <i>with plate</i>	Hopkins, Evan, C.E., F.G.S.	xi 44 260	1867
DISSEMBARKATIONS (Lecture to Officers of Volunteers)	Knollys, W. W., Maj. 93rd Highlrs.	Special } p.47 No. }	1873
DISTRIBUTION, The, of our War Forces, <i>with map</i>	Colomb, J. C. R., Captain Royal Marine Artillery	xiii 53 37	1869
DIVING Apparatus, Propositions in connection with, <i>with plate</i>	Bucknill, J. T., Lieut. R.E.	xv 65a 860	1871
DOVER Bay, the Proposed Enclosure of; Review of Designs, and Historical Essay on the Harbour, <i>with plates</i>	Redman, J. Baldry.	xix 83 659	1875
DRESS and Equipment of the Army, <i>with plate</i>	Walker, Arthur, Capt.	xi 45 375	1867
DRILL Book, Infantry, The Latest Changes made by the Prussians in their	Jones, E. M., Major 20th Regiment	xvi 68 527	1872
—— Prussian, 1876 .. .. .	Newdigate, E., Col.	xx 88 719	1876
DYER, Captain, a Few Notes on His Paper	Nicolson, Sir Fred. W.E., Bart., C.B., Vice-Admiral	xviii 77 290	1874
E.			
EASTERN Question, The Military Aspects of the, and the Turkish Forces	Vincent, C. E. H., Lieut.-Col.	xx 86 346	1876
ECONOMY of Coal, as viewed by the Commander of a Steam Vessel	Shortland, P. F., Capt. R.N.	xviii 76 2	1874
ECONOMY of Fuel, comprising Mineral Oils	Rankine, Professor W. J. Macquorn	xi 44 218	1867

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
		Vol. No. P.	
ECONOMY of Fuel in Ships of War, <i>see Fuel.</i>			
EDUCATION and Professional Instruction of Officers	Tulloch, Alexander B., Captain 69th Regiment	xvii 75 759	1873
EDUCATION of Staff Officers.. ..	Jones, Alfred S., Major, <i>W.C.</i>	xiv 59 271	1870
EDUCATION of the Army, with Reference to Young Officers	Middleton, F. D., Lt.-Col.	xv 65 686	1871
EDUCATION, (Preliminary), of Naval Officers	Goodenough, J.G., Capt. R.N.	xv 64 338	1871
EDUCATION, the Higher, of ditto .. ..	Ryder, A.P., Rear-Admiral	xv 65 734	1871
ELECTRIC - (MAGNETO) Light, <i>with illustrations</i>	Abney, W. de W., Capt. R.E.	xx 86 332	1876
ELEVATING Gun Platform, <i>with illustration</i>	Stone, C. P., Lieut. 77th Regiment	xiii 53 84	1869
END-ON and Broadside, Combined System, <i>with plates</i>	Symonds, T. E., Capt. R.N.	xi 46 485	1867
ENGINEERING, Field, Illustrated by some of the Operations of the German Engineers during the War of 1870-71, <i>with maps</i>	Schaw, H., Lt.-Col. R.E.	xviii 76 18	1874
ENGINES, Simple and Compound, the Comparative Merits of, <i>with plates</i>	Rennie, G. B., M.I.C.E.	xix 80 199	1875
ENGLAND, Observation on the Defence of ..	Soady, F.J., Lieut.-Colonel R.A.	xiv 61 570	1870
—— The Government Breech-Loading Rifles of, and of France and Prussia, <i>with plate</i>	Drake, Mervin, Capt. R.E.	xv 64 438	1871
—— the Royal Navy of .. ..	Anonymous ..	xx 86 419	1876
—— The Maritime Defence of, including Offensive and Defensive Warfare:—Part I. The Organization of our Maritime Forces. Part II. Our Ships of War, their Armament, &c., <i>with plates</i>	Scott, R. A. E., Capt. R.N.	xx 87 447	1876
ENGLISH and Foreign Maps, and their Use for Military Purposes	Wilson, C. W., Capt. R.E.	xvi 67 245	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
ENTRENCHING Tools, New Arrangement for, with a Method of Converting the Regulation Bell Tent into a Shelter Tent, <i>with illustrations</i>	James, Wm., late 42nd Highlanders	Vol. No. P. xvi 67 183	1872
ESSAY (The Institution's Military Prize, 1875).—Universal Conscription, the only Answer to the Recruiting Question	Hime, H. W. L., Capt. R.A.	xix 80 92	1875
— (The Naval Prize, 1876).—The Best Types of War Vessels for the British Navy, <i>with plates</i>	Noel, G. N. U., Comr. R.N.	xx 86 253	1876
— (The R.A. Institution Prize of 1874).—The Constitution and Duties of the Artillery of the Advanced Guard of an Army in the Field	Pratt, S.C., Lieut. R.A.	xviii 79 489	1874
EUPHRATES Valley Route to India, in connection with the Central Asian Question, <i>with map</i>	Andrew, W. P. . .	xvii 73 472	1873
EUROPE, The Armed Strength of . . .	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	xix 83 549	1875
EXERCISES, Gymnastic, The Military and Naval Force derivable from the Introduction of Military Drill, as part of a National System of Education, into all Elementary Schools	Chadwick, Edwin, C.B.	xiv 59 287	1870
EXPEDITION, Ashanti, of 1873 . . .	Wood, Evelyn, Col. U.C., C.B., 90th Regt.	xviii 78 331	1874
— The Red River, <i>with maps</i> . . .	Huyshe, G. L., Capt. Rifle Brig.	xv 62 70	1871
EXTRACTS from the four last Chapters of Admiral Jurien de la Gravière's Work	Ryder, A.P., Rear-Admiral	xvii 72 250	1873
EXPLOSIVE Agents applicable to Naval and Military Purposes as Substitutes for Gunpowder	Abel, F.A., F.R.S.	xvi 68 457	1872
— Bullets and their, Application to Military Purposes, <i>with plate</i>	Fosbery, G. V., Major, U.C., H. M. Bengal Staff Corps	xii 48 16	1868
EXPLOSIVES, Fog Signalling by, <i>with plates</i>	Maitland, E., Maj. R.A.	xix 82 481	1875

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
EXPLOSIVE Force of Gunpowder, The Determination of, <i>with plates</i>	Morgan, J. P., Capt. R.A.	Vol. No. P. XV 64 312	1871
EXPERIMENTS at Shoeburyness during the year 1868-69, Summary of	Mackie, Samuel J.	XIII 55 303	1869
EYE-Training, Target for .. .. .	Poore, F.H., Capt. R.M.A.	XVII 72 309	1873
<b>F.</b>			
FIELD Artillery on the Connected System, <i>with plate</i>	Ross, W.H., Major R.A.	XII 48 72	1868
——— Engineering, <i>see Engineering.</i>			
——— Railways, <i>see Railways.</i>			
FILTER, Description of a New .. .. .	Lord, W.B. (h.p.), R.A.	XII 51 503	1868
FIRING, Accurate, of Naval Ordnance by means of the Vessel's Motion, <i>with plates</i>	Bessemer, H. ..	XVII 75 888	1873
——— at Armour Clads reduced to a System, <i>with plate and illustration</i>	Orde-Browne, C., Capt. late R.A.	XVI 69 684	1872
FLEET-EVOLUTIONS and Naval Tactics ..	Bridge, Cyprian A. G., Comr. R.N.	XVII 72 227	1873
FLEET-MANŒUVRING, <i>with plates</i> .. ..	Pellew, Pownoll W., Comr. R.N.	XI 47 527	1867
FLEETS, Fog-Signals in .. .. .	Brent, H. W., Comr. R.N.	XV 63 136	1871
——— The Attack and Defence of, Part I., <i>with plates</i>	Colomb, P. H., Capt. R.N.	XV 64 405	1871
Ditto ditto Part II., <i>with illustrations</i>	„ „	XVI 66 1	1872
FLOATING Forts, <i>see Defences.</i>			
FOG-SIGNALS, Coast .. .. .	Beazley, Alex. ..	XVI 69 645	1872
——— for Vessels under Weigh, <i>with illustrations</i>	Richards, J. C., Staff Commander R.N.	XIX 82 491	1875
——— Some Account of the Observations recently made by the Corporation of the Trinity House on, <i>with plates</i>	Collinson, Sir Rich. K.C.B., Vice-Admiral.	XIX 82 465	1875



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
		Vol. No. P.	
FOG-SIGNALLING by Explosives, <i>see Explosives.</i>			
FORCES, our Military, The Constitution of, and the Conditions of Military Service	Robertson, A. Cunningham, Col.	XIII 56 477	1869
—— War, The Distribution of our, <i>with map</i>	Colomb, J. C. R., Captain Royal Marine Artillery	XIII 53 37	1869
FOREIGN Armies, The Practical Instruction of Staff Officers in, <i>with map</i>	Burnaby, F. G., Capt. Roy. Horse Guards	XVI 68 633	1872
—— and English Maps, and their Use for Military Purposes	Wilson, C. W., Capt. R.E.	XVI 67 245	1872
FORMS for Registering the angles of rolling, &c., <i>see Registering.</i>			
FORTIFICATIONS on the Russian-German frontier	Anonymous ..	XX 87 509	1876
FRANCE and Prussia in 1870, The Military Systems of	Brackenbury, C. B., Capt. R.A.	XV 63 232	1871
—— Manteuffel's Campaign in the East of, <i>with map</i>	Gun, H. A., Capt. R.E.	XVII 72 268	1873
—— the North of, a Visit to some of the Battle Fields and Ambulances of	Mouat, F. J., Surgeon-Maj., M.D.	XV 64 459	1871
—— Prussia, and England, The Government Breech-Loading Rifles of, <i>with plate</i>	Drake, Mervin, Capt. R.E.	XV 64 438	1871
—— State Navy of .. .. .	Anonymous ..	XX 86 419	1876
FRENCH and Montigny Mitrailleurs:— Machine Guns; the Gatling Battery, the Agar and Claxton Guns, <i>with plates</i>	Gatling, R. J. ..	XIV 60 504	1870
—— Army, The Constitution, Composition and Recruiting of	Balfour, G., Maj.-Gen. C.B., R.A.	XI 47 569	1867
—— Infantry Tactics, New .. ..	Hale, Lonsdale A., Maj. R.E.	XX 87 578	1876
—— International Exhibition of 1867, The Naval Department of	Colomb, P. H., Comr. R.N.	XII 48 54	1868
—— Rifle, New, <i>with plate</i> .. ..	Livesay, R. A. E., Capt. R.E.	XX 86 400	1876
FUEL, Economy of, in Ships of War, <i>with illustrations</i>	Prideaux, T. Symes, C.E.	XVI 68 315	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
FUEL, The Economy of, comprising Mineral Oils	Rankine, Professor W. J. Macquorn	Vol. No. P. XI 44 218	1867
G.			
GAME of Naval Tactics, <i>see Naval Tactics.</i>			
GATLING Gun; its place in Tactics, <i>with illustrations</i>	Rogers, E., Capt.	XIX 82 419	1875
GENEVA Convention of 1864, in Relation to Aid afforded by Volunteer Societies to Sick and Wounded Soldiers during the late Franco-Prussian War, &c.	Longmore, T., C.B., M.D.	XVI 67 206	1872
—— The Convention of, and National Societies for Aid to Sick and Wounded Soldiers in War	Furley, John ..	XX 88 632	1876
GEOGRAPHY, Military, of Central Asia, <i>with maps</i>	Baker, Valentine, Col. late 10th Hussars	XVIII 79 453	1874
GERMANY, Improvements in Tactics in, <i>see Tactics.</i>			
GERMAN Railway Regiment .. ..	Rawson, H.E., Lt. R.E.	XX 88 738	1876
—— Army in Peace and War, the Medical Department of the	Fox, T. W., Surgeon-Gen., R.E.	XX 87 560	1876
GILMORE's Safety Lamps for Mines and Ships, <i>with illustrations</i>	Gilmore, A. H., Comr. R.N.	XIV 59 394	1870
GOLD Coast of Africa, the best Mode of Defence of the Protected Territories on the, and the Organization of a Force sufficient for that Purpose, <i>with map</i>	Lauderdale, Adm. the Earl of, G.C.B.	XVII 74 676	1873
GREAT Guns (Naval), and Gunnery, <i>with illustrations</i>	Russell, John Scott	XIX 82 446	1875
—— Guns, the Revolving System of Firing, <i>with plates</i>	Sharpe, Benjamin, Comr. R.N.	XIII 56 460	1869
GRIFFITHS, Bow and Stern-Screw Steam-Ship, <i>see Bow and Stern-Screw, &amp;c.</i>			
GUN-CARRIAGE, Innes's Self-Acting, with Elevating Mantlet, <i>with illustrations</i>	Innes, Alex., Major Aberdeen Artillery Volunteers	XIX 82 524	1875
—— Muzzle-Pivoting; Lever, Fulcrum, and Incline Plane Principle, <i>with illustrations</i>	Heathorne, T. B. Capt. (h.p.) R.A.	XII 49 169	1868

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
GUNCOTTON, applied to Demolitions, <i>with plates</i>	Fisher, A. a'Court, Col., C.B., R.E.	Vol. No. P. XIV 60 419	1870
GUN, Description of Mont Storm's Breech-loading 9-pounder Field or Pinnace, <i>with illustrations</i>	Phelps, Charles ..	XIV 59 374	1870
—— Field, for India, <i>with plates</i> ..	Maxwell, H. H., Col. R.A.	XIV 58 179	1870
—— first 35-ton, Powder Pressures in the, <i>with plates</i>	Dawson, Wm., Comr. R.N.	XVII 70 1	1873
—— Light, Short, throwing a Heavy, Sharp - Edged, Discoidially - Formed Projectile, <i>with plate</i>	Hutchinson, W.N., Lt.-Gen.	XI 43 40	1867
—— Heavy Breech-Loading, of Novel Construction, a Proposal for, <i>with plates</i>	Morgan, J.P., Capt. R.A.	XIV 60 479	1870
—— Platform, Elevating, <i>illustrated</i> ..	Stone, C.P., Lieut. 77th Regt.	XIII 53 84	1869
—— The Mackay, and Projectiles, <i>with plate</i>	Mackay, James ..	XII 50 359	1868
—— The Macomber, <i>with plate</i> .. ..	Macomber, D. O., C.E.	XIX 81 268	1875
GUNPOWDER, Explosive Agents applicable to Naval and Military Purposes as Substitutes for	Abel, F.A., F.R.S.	XVI 68 457	1872
—— Schültze's Granulated-wood ..	Dougall, James D.	XII 48 127	1868
—— The Determination of the Explosive Force of, <i>with plates</i>	Morgan, J. P., Capt. R.A.	XV 64 312	1871
GUNS, Breech-Loading and Muzzle-Loading for, <i>with illustrations</i>	Morgan, J.P., Maj. R.A.	XVIII 78 408	1874
—— Field, Notes on .. ..	James, W. H., Lt. R.E.	XX 87 584	1876
—— Heavy, Rifling for, <i>with illustrations</i>	Morgan, J. P., Capt. R.A.	XVII 74 648	1873
—— Heavy, the Working of, and Projectiles, <i>with plates</i>	Cunningham, H.D. P., Major 3rd Hants Artillery Volunteers	XIV 57 108	1870
—— Heavy, Working, on the Broadside, with some observations on the All-Round Fire, combined with the Broad-side System of Armament, <i>with plate</i>	Wilson, Edmund, Capt. R.N.	XIII 53 110	1869

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
GUNS, Naval, <i>with plate</i> .. .. .	Dawson, Wm., Comr. R.N.	Vol. No. P. xvi 68 343	1872
—— Heavy, On Mounting and Working at Sea, <i>with plates</i>	„ „	xvi 86 401	1872
—— Machine—the Gatling Battery, the Agar and Claxton Guns, the French and Montigny Mitralleurs, <i>with illustration</i>	Gatling, R.J. ..	xiv 60 504	1870
—— The Working of Heavy Broadside..	Drew, Andrew A. W.	xi 43 67	1867
GYMNASTIC Exercises and Military Drill, The Military and Naval Force derivable from the Introduction of, as part of a National System of Education into all Elementary Schools	Chadwick, Edwin, C.B.	xiv 59 287	1870
H.			
HAMMOCK, Naval, its Buoyancy and Use in Saving Life at Sea in Cases of Collision, &c.	Ryder, A.P., Rear-Admiral	xv 62 111	1871
HANOVER, The Last Campaign of, <i>with maps</i>	Brackenbury, H., Capt. R.A.	xiv 58 255	1870
HARBOUR Defence .. .. .	Moncrieff, Alexander, Major	xix 81 357	1875
HARBOUR of Sevastopol; Ship Raising, especially with reference to his Experience in Raising the Russian Ships sunk in the, <i>with plates</i>	Gowen, John E., Colonel United States Army	xiii 55 348	1869
HARBOURS, Military or Strategic, and Refuge	Coode, Sir John, Kt., C.E.	xix 81 334	1875
—— Military, The Strategical Importance of the, in the British Channel, as connected with Defensive and Offensive Operations, <i>with maps and plate</i>	Collinson, T. B., Maj.-Gen. R.E.	xviii 77 227	1874
HELIOGRAPH, or Sun Telegraph, Mance's..	Goode, Samuel ..	xix 83 533	1875
HELM Indicator, for the Prevention of Collisions at Sea, <i>with illustrations</i>	Read, George, R.N.	xii 48 141	1868



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
HELM-SIGNALS, Read and Nicholl's Patent Day and Night, for Preventing Collisions at Sea, <i>with plate</i>	Read, George, R.N.	Vol. No. P. xvi 69 749	1872
HERAT to Khiva, Journeys from, <i>with map</i>	Goldsmid, Sir Frederick J., Major-General, C.B., K.C.S.I.	xix 80 1	1875
HILL's Boat Lowering and Self-Detaching Apparatus, <i>with plate</i>	Hill, E. J. ..	xvi 69 762	1872
HINDUSTAN and Central Asia, the Steppes of; The Communications, Commercial and Military, between, <i>with map</i>	Adair, R.A. Shafto, Col.	xi 45 362	1867
HISTORY, Military, The Study of, by the Regimental Officers of the Army, <i>with maps</i>	Hale, Lonsdale A., Maj. R.E.	xx 87 508	1876
HISTORICAL Records of the 1st Regiment of Militia, or 3rd West York Light Infantry—(Notice of Book)	Raikes, G.A., Capt. 3rd W. Y. L. I.	xx 88 761	1876
HISTORY, Naval, The Scientific Study of ..	Laughton, J. K., R.N.	xviii 79 508	1874
HOLLAND, The Military Resources of ..	Vincent, C. E. H. Lieut.-Col. Central London Rifle Rangers	xx 87 575	1876
HOLMES's Storm and Signal Lights, <i>illustrated</i>	Holmes, Nathaniel	xvi 66 24	1872
HONDURAS, Extracts from a Report on Orange Walk, New River, as a Military Position for the Protection of British Interests in, with Notes and Experiences on Outpost Duty in the Bush	Bale, Lieut. 1st W. I. Regt.	xvii 75 806	1873
HOSPITAL Ship, H. M. S. "Victor Emanuel" as an, during the late Ashantee Campaign, <i>with plate</i>	Ryder, A.P., Vice-Admiral	xviii 78 383	1874
—— Ships, Ventilation of, <i>with plates</i> ..	Macdonald, J. D., M.D., Staff-Surgeon R.N.	xviii 76 136	1874
—— Barracks, Camps and Shipping, &c., Suggested Improvements in Sanitary Arrangements of	Synge, Millington, Maj.-Gen. R.E.	xviii 78 299	1874
HORSES for Military Purposes, The Breeding of	Hozier, H. M., Capt.	xvi 69 735	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
HOTSPUR-GLATTON Experiments, Lessons from the, <i>with plates</i>	Barnaby, Nathaniel, Chief Naval	Vol. No. P. XVII 72 294	1872
— — — Discussion .. .. .	„ „	„ „ 315	1872
HYGIENE, Military .. .. .	De Chaumont, F., M.D., Army Medical School, Netley	XIV 59 336	1870
I.			
INDIA, Certain Roads between Turkestan and, independent of the Oxus or of any Oxus Boundary, <i>with map</i>	Goldsmid, Sir Frederick J., Colonel, C.B., K.C.S.I.	XVIII 79 469	1874
— — — On Military Transport and Supply in	Collen, E. H. H., Lieut. R.A.	XVI 68 477	1872
— — — The Euphrates Valley Route to, in connection with the Central Asian Question, <i>with map</i>	Andrew, W. P. ..	XVII 73 472	1873
— — — The Field Gun for, <i>with plates</i> ..	Maxwell, H. H., Col. R.A.	V 179	1870
— — — The North-West Frontier of, <i>with map</i>	Campbell, George, Bengal Civil Service	XIII 54 217	1869
— — — The Military Advantages of a Daily Mail Route to, through Turkey and the Persian Gulf, <i>with map</i>	Clarke, Hyde ..	XII 49 181	1868
INDIAN Forces, The Sikh and European Soldiers of our	Eyre, Vincent, Maj.-Gen., C.B., R.A.	XI 43 86	1867
INFANTRY Forces and Infantry Reserves, Our, and Army Organization	Leahy, Arthur, Maj. R.E.	XII 50 310	1868
— — — Our, Is a Radical Change in the Tactical formation of, Really Necessary?	Thesiger, Hon. Frederic, Col., C.B.	XVII 73 411	1873
— — — Tactics .. .. .	Williams, W. J., Col. R.A.	XVI 69 768	1872
— — — Tactics, The New French .. ..	Hale, Lonsdale A., Maj. R.E.	XX 87 578	1876
INGLEFIELD'S New Hydraulic Steering Apparatus, as being fitted to H.M.S. "Achilles," <i>with plate</i>	Inglefield, E. A., Captain R.N.	XIII 53 22	1869

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
INNES'S Self-Acting Gun-Carriage, with Elevating Mantelet, <i>with illustrations</i>	Innes, Alex., Major Aberdeen Artillery Volunteers	Vol. No. P. XIX 82 524	1875
INSTRUCTION, Scientific, in the Navy ..	Laughton, J. K., R.N.	XIX 81 217	1875
INSTRUMENTS, Improved, for Military Sketching, <i>illustrated</i>	Hutchinson, A.H., Maj. R.A.	XVII 70 65	1873
INSUFFICIENT Stability of H.M.'s late Turret Ship "Captain" and of other Ironclads, on the Causes of, <i>with plates</i>	Fishbourne, E. Gardiner, Rear- Admiral, C.B.	XV 62 1	1871
INTELLIGENCE Duties of the Staff, Abroad and at Home	Brackenbury, C.B., Maj. R.A.	XIX 81 242	1875
INVADING Force Landing on the East Coast, The Protection of London against an, <i>with map</i>	Tulloch, Alexan- der B., Capt. 69th Regt.	XIV 59 358	1870
INVASION, Our Naval and Military Es- tablishments regarded with reference to the Dangers of	Harcourt, Vernon, Esq., Q.C., M.P.	XVI 68 575	1872
—— The Strategy of, as exemplified in the American and Austro-Prussian Wars, and in the War of Metz, with Remarks on Centres of Defence and the Training of National Forces	Adair, R. A. Shafto, Col.	XVI 67 153	1872
IRONCLADS, Circular, <i>with plates</i> .. ..	Reed, E. J., C.B., M.P.	XX 85 85	1876
—— Present and Future, <i>with plate</i> ..	Henwood, Charles F.	XIV 58 148	1870
IRONCLAD Ships of War, New Form of, <i>with illustration</i>	Wheatley, John, Capt. R.N.	XV 64 476	1871
IRON Ships and Iron Beams, &c., of Wooden Vessels, the Demagnetization of, to prevent the Deviation of the Compasses, experimentally shown by means of a Model, <i>with plates</i>	Hopkins, Evan	XI 44 260	1867
—— Ships, The Present State of our Knowledge regarding the Magnetism of, <i>with plates</i>	Evans, F. J., Staff Capt. R.N.	XVI 66 78	1872
—— The Application of, to Fortifications, <i>with plates</i>	Jervois, Col., C.B., R.E.	XII 52 548	1868
ITALIAN Army, The, <i>with illustration</i> ..	Waveney, Col. Lord	XX 86 359	1876

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
<b>J.</b>			
JAHRESBERICHTE über die Veränderungen und Fortschritte im Militairwesen— (Notice of Book)	Anonymous	xx 87 590	1876
<b>K.</b>			
KAFIR Wars, British Troops and Savage Warfare, with special reference to, <i>with map</i>	Gawler, Col., late 73rd Regt.	xvii 75 922	1873
KHIVA, Journeys from Herat to, <i>with map</i>	Goldsmid, Sir Freder- ick J., Major- General, C.B., K.C.S.I.	xix 80 1	1875
——— The late Russian Campaign against, <i>with map</i>	Trench, F. Chene- vix, Capt. 20th Huss.	xviii 77 212	1874
KNAPSACK, White's Porte-, <i>with illustration</i>	White, Wm.*	xvi 69 747	1872
KÖNIGGRATZ, The Battle of, <i>with maps</i> ..	Walker, Beau- champ, Col., C.B., Military Attaché, Berlin	xii 51 440	1868
<b>L.</b>			
LABOUR, Military .. .. .	Webber, C. E., Capt. R.E.	xiv 57 73	1870
LAMPS, Safety, Gilmore's, for Mines and Ships, <i>with illustration</i>	Gilmore, A. H., Comr. R.N.	xiv 59 394	1870
LAND-Transport Service of the Army, Suggestions for	Beazley, G. G., Capt. 83rd Regt.	xiii 56 564	1869
LAUNCH of H.M.S. "Northumberland," <i>with plates</i>	Hay, Sir Jno. C.D., Bart., C.B., M.P.	xiii 56 435	1869
LAW, Military .. .. .	Blake, G. Frederic, Capt. R.M.	xi 47 506	1867
LEITFADEN für den Unterricht in der Dienstkenntniss auf den Königlichen Kriegsschulen—(Notice of Book)	Schnackenburg, Capt.	xx 88 761	1876
LE MANS, The Winter Campaign of, <i>with maps</i>	Brackenbury, C.B., Capt. R.A.	xv 64 580	1871
LIFE-BUOYS, Improved, and a System of Deck-Rafts for Saving Life at Sea, <i>illustrated</i>	Hamilton, Mark, M.D., Surgeon R.N.	xvii 74 725	1873

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
LIFE-SAVING Apparatus, Rogers's, <i>with plate</i>	Rogers, J. B. ..	Vol. No. P. XIV 57 28	1870
——— Bed or Mattrass .. ..	Smith, Henry ..	XIII 54 216	1869
LIGHT Infantry, Movements, &c., of ..	Bell, T. Lynden, Major 1st Batt. 6th Regt.	XIV 61 584	1870
——— Vessels, &c., apparatus for ..	Read, George, R.N.	XII 48 144	1868
LIGHTING of H.M. Ships, <i>with plate</i> ..	Colomb, P. H., Capt. R.N.	XVI 68 437	1872
LIGHTS, Improved Binnacle, The Earl of Caithness's Gravitating Compass, and Nunn's, <i>with plate</i>	Colomb, P. H., Comr. R.N.	XII 49 272	1868
——— Signal, of Captains Colomb and Bolton, <i>with plate</i>	„ „	XII 50 373	1868
——— Storm and Signal, Holmes's, <i>illustrated</i>	Holmes, Nathaniel,	XVI 66 24	1872
LISSA, Lessons from, <i>with plate</i> .. ..	Colomb, P. H., Comr. R.N.	XI 43 104	1867
LONDON, The Protection of, against an Invading Force Landing on the East Coast, <i>with map</i>	Tulloch, Alexander B., Captain 69th Regt.	XIV 59 358	1870
LOWERING and Raising, Engaging and Disengaging Ships' Boats, on Improve- ments in Apparatus for, <i>with plate</i>	Folkard, A.	XVIII 77 278	1874
——— and Sustaining Ship's Quarter- Boats, <i>Plan of, with plates</i>	Simpson, C. H., Capt. R.N.	XI 47 519	1867
——— Boats at Sea, <i>with plate</i> .. ..	Lacon, W. Stirling	XVII 71 97	1873
LUMLEY's Patent Rudder, <i>with plates</i> ..	Lumley, Henry ..	XIV 57 70	1870
LUSHAIE Expeditionary Force, 1871-72, An Account of the Proceedings of the Chittagong Column of, <i>with map</i>	East, C.J., Brevet- Maj. 41st Regt.	XVII 71 113	1873
M.			
MACHINE Guns:—the Gatling Battery, the Agar and Claxton Guns, the French and Montigny Mitrailleurs, <i>illustrated</i>	Gatling, R. J. ..	XIV 60 504	1870
MACKAY Gun and Projectiles, <i>with plate</i> ..	Mackay, James ..	XII 50 359	1868
MACOMBER Gun, <i>with plate</i> .. ..	Macomber, D. O.	XIX 81 268	1875



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
MAGNETISM of Iron Ships, the Present State of our Knowledge regarding the, <i>with plate</i>	Evans, F. J., Staff Capt. R.N.	Vol. No. P. XVI 66 78	1872
MAGNETO.-ELECTRIC Light, <i>with illustrations</i>	Abney, W. de W., Capt. R.E.	XX 86 332	1876
MANŒUVRES, Autumn, Abroad and at Home, 1869-70	Codrington, Sir William J., Gen.	XVI 68 497	1872
——— Autumn, of England .. ..	Brackenbury, C.B., Capt. R.A.	XVI 67 222	1872
——— of 1872 .. ..	" "	XVII 71 73	1873
——— Peace, Artillery Fire in, <i>illustrated</i>	Carmichael, L. M., Capt. 5th Royal Irish Lancers	XVIII 78 449	1874
——— Peace, the Theory and Practice of, with their Relation to Real Warfare, <i>with maps</i>	Chesney, C. C., Lt.-Col. R.E.	XVI 68 550	1872
——— The Autumn, of the Prussian Guard Corps in September, 1872, <i>with maps</i>	Hildyard, H., Lt. 72nd Highlanders	XVI 69 781	1872
MANCE'S Heliograph, or Sun Telegraph ..	Goode, Samuel ..	XIX 83 533	1875
MANNING the Navy .. ..	Reddie, James	XI 45 279	1867
MANTLET, Moveable Steel, for the Protection of Artillery and Troops, <i>with plate</i>	Eddy, Charles B.	XIII 55 326	1869
——— Elevating, with Innes's Self-Acting Gun-Carriage, <i>illustrated</i>	Innes, Alex., Major Aberdeen Artillery Volunteers	XIX 82 524	1875
MANTEUFFEL'S Campaign in the East of France, <i>with map</i>	Gun, H. A., Capt. R.E.	XVII 72 268	1873
MAPS, English and Foreign, and their Use for Military Purposes	Wilson, C. W., Capt. R.E.	XVI 67 245	1872
——— Notes on (Lecture to Officers of Volunteers)	" "	Special } No. } p.38	1873
MARCHES .. ..	Colley, G. P., Maj. 2nd Queen's, &c.	XVII 70 47	1873
MARINE and Army Night Telegraph, The Spakowsky	Doty, H. H., Capt.	XI 47 658	1867
MARINES, The Royal, are they a Necessary Auxiliary to the Royal Navy?	Schomberg, Major-General, C.B., R.M.A.	XV 64 486	1871

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	No., Vol., and Page of Journal.	Year.
MARITIME Defence of England, <i>see Defence.</i>		Vol. No. P.	
—— Rights .. .. .	Ross of Bladens- berg, John, Cold- stream Guards	xx 87 423	1876
MARTINI-HENRY Rifle, Proposed Alter- ations in, <i>illustrated</i>	Thayer, L.O., M.D.	xix 83 654	1875
—— Rifle, <i>with plates</i> .. .. .	Majendie, V. D., Capt. R.A.	xiii 55 360	1869
MEDICAL Department of the German Army in Peace and War	Fox, T. W., Sur- geon-Gen. R.E.	xx 87 560	1876
MEMORY, a New Method of Improving the, and Facilitating the Acquirement of Knowledge	Pick, Dr. E. ..	xi 43 78	1867
MERCANTILE Marine, The, considered as an Auxiliary to the Royal Navy	Brassey, Thos., M.P.	xx 87 493	1876
MERCHANT Service, Is Our, any Longer a Feeder to the Royal Navy?	Wilson, J.C., Capt. R.N.	xx 85 61	1876
META-CENTRE, Ship's, Practical Method of Finding, at great Angles of Inclina- tion, <i>illustrated</i>	Blom, T.A., Chief Constructor, Nor- wegian Navy	xvii 73 423	1873
METEOROLOGY, The Sea Temperature and Currents of the 10° square of the Atlantic which lies between the Equa- tor and 10° N., and from 20° to 30° W., <i>with plates</i>	Toynbee, H., Capt.	xvii 72 331	1873
MILITIA and Volunteers—the recent War, with reference to (Lecture to Officers of Volunteers)	Home, R., Capt. R.E.	Special } p.61 No. }	1873
MILITARY Law, <i>see Law.</i>			
MILITARY and Naval Establishments, Our, regarded with reference to the Dangers of Invasion	Harcourt, Vernon, Esq., Q.C., M.P.	xvi 68 575	1872
—— and Naval Force, The, derivable from the Introduction of Military Drill and Gymnastic Exercises, as part of a National System of Education into all Elementary Schools	Chadwick, Edwin, C.B.	xiv 59 287	1870
—— Forces, the Constitution of Our, and the Conditions of Military Service	Robertson, A. Cunningham, Col.	xiii 56 477	1869

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
MILITARY Forces, Organization of, <i>see Organization.</i>		Vol. No. P.	
—— Telegraphy and Signalling, <i>see Tele- graphy.</i>			
—— Hygiene .. .. .	De Chaumont, F., M.D.	XIV 59 336	1870
—— Labour .. .. .	Webber, C.E., Capt. R.E.	XIV 57 73	1870
—— Maxims Suggested or Exemplified by the last Autumn Manœuvres of Continental Armies, <i>with plans</i>	Shute, C. Cameron, Col., C.B.	XIV 58 206	1870
—— Model Apparatus .. .. .	Clarke, E. Pod- more, Capt.	XIX 84 758	1875
—— Organization, General Principles of	Colomb, J. C. R., Capt. Royal Mar. Artillery	XV 64 288	1871
—— Resources of Holland .. .. .	Vincent, C. E. H., Lieut.-Col. Central London Rifle Rangers	XX 87 575	1876
—— General School, a Proposition for one, for the Army	Collinson, T. Ber- nard, Col. R.E.	XIII 54 241	1869
—— Science, The Study of, in time of Peace	Chesney, C.C., Lt.- Col. R.E.	XV 63 254	1871
—— Training, a Means of Adminis- trative Power and of Political Use- fulness	Goldsmid, Sir Fre- derick J., Major- General, C.B., K.C.S.I.	XX 87 524	1876
—— Transport .. .. .	Wingfield, F., Dep. Assistant Com- missary-General	XIII 54 263	1869
MINES and Ships, Gilmore's Safety Lamps for, <i>illustrated</i>	Gilmore, A. H., Comr. R.N.	XIV 59 394	1870
MITRAILLEURS, a Memorandum on ..	Shute, C. Cameron, Col., C.B.	XVI 66 53	1872
—— and their Place in the Wars of the Future, <i>with plates</i>	Fosbery, G.V., Maj. G. C., H. M. Bengal Staff Corps	XIII 56 539	1869
——, the Employment of, during the Recent, War and their Employment in Future Wars, <i>with plate</i> .. .. .	Fletcher, H. C., Lt.-Colonel Scots Fusilier Guards	XVI 66 28	1872

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
MONCRIEFF System of Mounting Ordnance, Further Observations on, <i>with plate</i>	Moncrieff, Alexander, Maj.	Vol. No. P. XVII 74 592	1873
—— System of Mounting Ordnance, Observations on the, <i>with plates</i>	English, T., Lieut. R.E.	XVII 74 568	1873
MONCRIEFF'S Protected Barbette System, Further Particulars Regarding, <i>with plate</i>	Moncrieff, A., Captain, Edinburgh Artillery Militia	XI 44 241	1867
MONCRIEFF System, The Progress that has been made in the Application of, to Garrison, Siege, and Naval Ordnance, and to Coast Works, <i>with plates</i>	" "	XIV 59 396	1870
MONT STORM'S Breech-Loading 9-pounder Field or Pinnace Gun, Description of, <i>with illustrations</i>	Phelps, Charles ..	XIV 59 374	1870
MOUNTED Riflemen (Lecture to Officers of Volunteers)	Wood, Evelyn, Lt.-Col., W.C., 90th L. I.	Special } p.13 No.	1873
MUSKETRY Practice, Annual, Proposed Alterations in, so as to bring it into accordance with the Infantry Tactics of the Day, <i>with illustrations</i>	Brooke, Chas. K., Capt. 15th Regt.	XIX 80 22	1875
MUZZLE-PIVOTING Gun-Carriages; Lever, Fulcrum, and Incline-Plane Principle, <i>with plate</i>	Heathorne, T. B., Capt. (h.p.) R.A.	XII 49 169	1868
MUZZLE-LOADING and Breech-Loading for Guns, <i>with illustrations</i>	Morgan, J.P., Maj. R.A.	XVIII 78 408	1874
N.			
NATIONAL Forces, The Strategy of Invasion, as exemplified in the American and Austro-Prussian Wars and in the War of Metz, with Remarks on Centres of Defence and the Training of	Adair, R. A. Shafto, Col.	XVI 67 153	1872
NAUTICAL Surveying, Practical, <i>with plates</i>	Hull, T. A., Staff Comr. R.N.	XVI 69 701	1872
NAVAL and Military Establishments (Our), regarded with reference to the Dangers of Invasion	Harcourt, Vernon, Esq., Q.C., M.P.	XVI 68 575	1872
—— and Military Force, The, derivable from the Introduction of Military Drill and Gymnastic Exercises, as part of a National System of Education into all Elementary Schools	Chadwick, Edwin, C.B.	XIV 59 287	1870

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
NAVAL Steam Transport Fleet, <i>see Steam Transport.</i>		Vol. No. P.	
—— Department of the French International Exhibition of 1867	Colomb, P. H., Comr. R.N.	XII 48 54	1868
—— Great Guns and Gunnery, <i>illustrated</i>	Russell, John Scott	XIX 2 446	1875
—— Guns, <i>with plates</i> .. .. .	Dawson, Wm., Comr. R.N.	XVI 68 343	1872
—— History, The Scientific Study of ..	Laughton, J. K., R.N.	XVIII 79 508	1874
—— Officers, Our, and the Public Services: Proposed Employment of Her Majesty's Ships and Naval Officers in connection with the Mail and Troop Services combined	Clanchy, H. T., Lieut. R.N.	xv 65 824	1871
—— ———, the Higher Education of, <i>see Education.</i>			
—— Officers, The Preliminary Education of	Goodenough, Jas. G., Capt. R.N.	xv 64 338	1871
—— Ordnance, On the Accurate Firing of, by means of the Vessel's Motion, <i>with plates</i>	Bessemer, H. ..	XVII 75 888	1873
—— Organization, General Principles of	Colomb, J. C. R., Capt. Royal Marine Artillery	xv 64 269	1871
—— Power, The True Economies of England's	Selwyn, J.H., Capt. R.N.	xv 63 157	1871
—— Reserves .. .. .	Brassey, Thos., M.P.	XVII 73 501	1873
—— Reserve, Royal, Three Years with the	Brent, H. W., Comr. R.N.	XVIII 78 358	1874
—— Matters, Notes on .. .. .	Anonymous ..	XX 86 413	1876
—— Tactics, Ancient, <i>with plates</i> ..	Warre, the Rev. Edmond, M.A.	XX 88 593	1876
—— Tactics, <i>see also Fleet Evolutions.</i>			
—— Tactics, A New System of, <i>with plate</i>	Bower, Graham, Lieut. R.N.	XIX 82 502	1875
—— Tactics, Game of, <i>with plates</i> ..	Castle, W. M. F., Lieut. R.N.	XVII 75 786	1873



SUBJECT OF LECTUER OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
NAVAL Tactics, <i>with plate</i> .. .. .	Inglefield, E. A., Capt. R.N.	Vol. No. P. XII 51 483	1863
NAVY, H.M., The Preservation of Biscuit and other Farinaceous Articles of Diet in, from Weevil, Maggots, and other Insects, <i>with illustrations</i>	Seccombe, E. ..	XIX 83 681	1875
—— Manning the .. .. .	Reddie, James ..	XI 45 279	1867
—— Royal, Reserves of Officers and Seamen, <i>see Reserves.</i>			
—— Scientific Instruction in the ..	Laughton, J. K., R.N.	XIX 81 217	1875
—— The American, its Organization, Ships, Armament, and Recent Experiences, <i>with plates</i>	Hamilton, J. Randolph	XII 49 243	1868
—— The Royal, Are the Royal Marines a Necessary Auxiliary to?	Schomberg, Major-Gen. C.B., R.M.A.	XV 64 486	1871
—— The Royal, Is our Merchant Service any Longer a Feeder to?	Wilson, J.C., Capt. R.N.	XX 85 61	1876
—— The Royal, The Mercantile Marine considered as an Auxiliary to	Brassey, Thos., M.P.	XX 87 493	1876
NIGHT Telegraph, The Spakowsky, Marine and Army	Doty, H. H., Capt.	XI 47 658	1867
NICHOLL and Read's Patent Day and Night Helm-Signals for Preventing Collisions at Sea, <i>with plate</i>	Read, George, R.N.	XVI 69 749	1872
NOLAN's Range Finder and Ranges, <i>illustrated</i>	Nolan, Jno. Philip, Capt. R.A.	XIV 57 1	1870
"NORTHUMBERLAND," The Launch of H.M.S., <i>with plates</i>	Hay, Sir John C.D., Bart., C.B., M.P.	XIII 56 435	1869
NOTES on Naval Matters, <i>see Naval Matters.</i>			
O.			
OCEAN Currents .. .. .	Laughton, J. K., R.N.	XV 65 663	1871
—— Currents and their Influences, <i>with map</i>	Findlay, A. G. ..	XIV 58 133	1870
OFFICERS, Regimental, the Appointment and Promotion of	Robertson, A. Cunningham, Col.	XII 49 192	1868

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
		Vol. No. P.	
OFFICERS, Education of, <i>see Education</i>			
—— Staff, the Education of .. ..	Jones, Alfred S., Maj., <i>U.C.</i>	XIV 59 271	1870
OILS, Mineral, Comprising the Economy of Fuel	Rankine, Professor W. J. Macquorn	XI 44 218	1867
—— Mineral, further Information on the Employment of, as Fuel for Steam Ships, <i>with plate</i>	Selwyn, J. H., Capt. R.N.	XII 48 28	1868
ORANGE Walk, New River, Extracts from a Report on, as a Military Position for the Protection of British Interests in Honduras, with Notes and Experiences on Out-Post Duty in the Bush	Bale, Lieut. 1st W.I. Regt.	XVII 75 806	1873
ORDNANCE, Aikman's Instruction—Rifle and Prac-Tester for, <i>with plate</i>	Aikman, F. R., Lt.- Col., <i>U.C.</i>	XV 65A 847	1871
—— Night Sight Vane or Collimator ..	Croudace, W. S.	XVIII 77 269	1874
—— Cast-Iron, The Conversion and Rifling of, and on Chilled White Iron Projectiles, <i>with plates</i>	Palliser, William, Maj.	XI 44 149	1867
—— The Construction of Heavy Rifled, <i>with plate</i>	„ „	XII 50 378	1868
—— Heavy, a Proposed Method of Mounting at Sea, on the Principle of the Bessemer Saloon	Strange, Alex., Lt.- Col.	XVII 75 836	1873
—— Heavy, The Progress of Our, and the Principles and Progress of its Construction, <i>with plates</i>	Stoney, F. S., Capt. R.A.	XIV 58 230	1870
—— Observations on the Moncrieff System of Mounting, <i>with plates</i>	English, T., Lieut. R.E.	XVII 74 568	1873
—— Note on Aligning the Sights of, when Laying for an Object, <i>illustrated</i>	Grenfell, H. H., Lieut. R.N.	XVII 74 746	1873
ORGANIZATION and Employment of Cavalry, with Discussion on ditto	Baker, Valentine, Col. late 10th Hussars	XVII 73 374	1873
—— an, for the Army of England ..	Bevan - Edwards, G., Maj. R.E.	XII 5 295	1868
—— Army, our Infantry Forces and Infantry Reserves	Leahy, Arthur, Maj. R.E.	XII 50 310	1868
—— of our Military Forces .. ..	„ „ Lieut.-Col., R.E.	XV 63 176	1871

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
ORGANIZATION of the Communications of an Army, including Railways, <i>illustrated</i>	Home, Lieut.-Col. R.E., C.B.	Vol. No. P. XIX 82 381	1875
OUTPOST Duty, <i>with plate</i> .. .. .	Walker, Beau- champ, Maj. - Gen., Military Attaché, Berlin	xv 65 813	1871
OXUS, The, Certain Roads between Turkestan and India, independent of, or of any Oxus Boundary, <i>with map</i>	Goldsmid, Sir Frederic J., Colonel, C.B., K.C.S.I.	xviii 79 469	1874
<b>P.</b>			
PARIS, Personal Experiences and Reminiscences of the Siege of, <i>with plate</i>	Wyatt, Surgeon-Major, Coldstream Guards	xvii 71 157	1873
—— The New Works for the Defence of, <i>with maps</i>	Tyler, E. S., Major R.E.	xix 80 74	1875
PARKER-RHODES' Military Boot .. .. .	Parker-Rhodes, C. E.	xvi 69 764	1872
PATROLLING, Ride and Tie, and Section Skirmishing	Jones, Lieut.-Col., W.C.	xvi 66 127	1872
PEARL ROCK, H.M. Ship "Agincourt" on and off the, <i>with plates</i>	Boyle, R. H., Comr. R.N.	xvi 67 189	1872
PEBBLE-Powder, Recent Improvements in the Manufacture of, <i>illustrated</i>	Morgan, J. P., Maj. R.A.	xviii 77 171	1874
PERSIAN Point of View of the Strategy of Russia in Central Asia, <i>with maps</i>	Smith, R. Murdoch, Capt. R.E.	xvii 71 212	1873
PHOTOGRAPHY applied to Military Science, <i>with plates</i>	Baillie, J., Lt.-Col. H.M. Bengal Staff Corps	xiii 56 449	1869
—— The Application of to Military Purposes	Pritchard, H. Baden	xiii 55 419	1869
PLUG (Shot), Expanding; Expanding Sponge for Artillery Practice and Anti-Torpedo Vessel, <i>with plates</i>	Gilmore, A. H., Lieut. R.N.	xiii 53 30	1869
PONTOONS, Canvas, Proposed Plan of, to be made out of Ships' Stores, <i>with plate</i>	Moore, Arthur, Lt. R.N.	xix 84 739	1875
POWDER-Pressures in the first 35-ton Gun	Dawson, Wm., Comr. R.N.	xvii 70 1	1873
POWDERS, Some Special Features in Large and Small Grain, <i>illustrated</i>	Morgan, J. P., Maj. R.A.	xx 86 195	1876

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No, and Page of Journal.	Year.
PRECISION, Arms of, How far the Employment of Cavalry is Affected by Recent Improvements in	Smith, Michael W., Maj.-Gen., C.B.	Vol. No. P. XII 49 147	1868
————— The Amount of Advantage which they give to the Defence over the Attack	Schaw, H., Capt. R.E.	XIV 59 377	1870
PRIMITIVE Warfare, <i>see Warfare.</i>			
PROMOTION, The Austrian Confidential Report, and New Method of	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	XVI 66 151	1872
PROJECTILES, Chilled White Iron, and the Conversion and Rifling of Cast-Iron Ordnance, <i>with plates</i>	Palliser, William, Major late 18th Hussars	XI 44 149	1867
———— et la Loi des Erreurs, Sur la Dispersion Naturelle des—(Notice of Book)	Van Meyden, Aloys., Capt. d'Artillerie, Lausanne	XX 88 762	1876
———— Working Heavy Guns and, <i>with plates</i>	Cunningham, H. D. P., Major 3rd Hants Artillery Volunteers	XIV 57 108	1870
PROJECTILE, The Best Form of Cartridges for Breech-Loading Small Arms, <i>with plate</i>	O'Hea, J. B., Capt. late 25th Regt.	XII 48 105	1868
PROPELLER, a Cylindrical, Working on a Vertical Shaft in the Midship Section of a Ship, <i>illustrated</i>	Skinner, Major- General, C.B.	XIV 58 174	1870
———— Screw, Further Experiments with his Bow and Stern, <i>with plate</i>	Griffiths, R., C.E.	XVIII 77 157	1874
———— of H. M. S. "Bruiser," On the Casing of the, <i>with plate</i>	" "	XX 86 171	1876
PROPELLING Steam Ships, best Method of	" "	XX 88 684	1876
PROPELLER, The Hydraulic, as a Motive Power for Ships, <i>illustrated</i>	Elliot, G., Vice- Admiral	XI 47 589	1867
———— The Turbine, <i>with plate</i>	Murray, And., C.B.	XV 65 643	1871
PROPELLERS, Proposed New Combination of, for Ships of War	Quick, Geo., Engi- neer R.N.	XX 86 157	1876
PROPULSION, a New Mode of Marine, <i>with plate</i>	Simpson, C. H., Capt. R.N.	XI 47 646	1867
———— Screw, a New Adaptation of, <i>with plate</i>	Paynter, J. Aylmer, Rear-Admiral	XVIII 79 527	1874

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
PRUSSIAN Drill, 1876 .. .. .	Newdigate, E., Col.	Vol. No. P. xx 88 719	1876
— Army, System of Officering, A Brief Sketch of	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	xvi 69 796	1872
— Drill-Book, Changes in, <i>see Drill.</i>			
PRUSSIA, The Government Breech-Loading Rifles of, and of France and England, <i>with plate</i>	Drake, Mervin, Capt. R.E.	xv 64 438	1877
— The Military Systems of, and of France in 1870	Brackenbury, C.B., Capt. R.A.	xv 63 232	1871
<b>R.</b>			
RAILWAYS, On the Organization of the Communications of an Army, including, <i>illustrated</i>	Home, Lieut.-Col. R.E., C.B.	xix 82 381	1875
— Field, and their General Appli- cation in War, <i>with plates</i>	Luard, C.E., Capt. R.E.	xvii 74 693	1873
RAILWAY Regiment, The German .. ..	Rawson, H. E., Lt. R.E.	xx 88 738	1876
RANGE-INDICATOR, Campbell's, <i>with plate</i>	Campbell, J. R., Capt. Hants Mili- tia Artillery	xvi 67 309	1872
RANGES and Nolan's Range Finder ..	Nolan, John Philip, Capt. R.A.	xiv 57 1	1870
READ and Nicholl's Patent Day and Night Helm-Signals, for Preventing Collisions at Sea, <i>with plate</i>	Read, George, R.N.	xvi 69 749	1872
RECOIL Utilized, <i>with plate</i> .. ..	Hutchinson, W.N. Lt.-Gen.	xiii 53 75	1869
RECORDS, Historical, of the First Regiment of Militia, or 3rd W. Y. L. Infantry— (Notice of Book)	Raikes, G.A., Capt. 3rd W. Y. L. I. Militia	xx 88 761	1876
RECRUITING, Constitution and Composition of the French Army	Balfour, G., Maj.- Gen., C.B., R.A.	xi 47 569	1867
— for the Army, The Best Mode of, and the Influences bearing upon that Service	Noake, R. C., Capt. Adjutant Scot- tish Borderers Militia	xi 43 27	1867
— Question, The, from a Military and a Medical point of View	Adams, A. Leith, M.D., Surg.-Maj.	xviii 76 55	187



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
RECRUITING Question, Universal Conscript- tion, the Only Answer to.—(The Insti- tution's Military Prize Essay, 1875)	Hime, H. W. L., Capt. R.A.	Vol. No. P. XIX 80 92	1875
—— Discussion on .. .. .		„ „ 146	„
—— System, The Establishment of County Military Training Schools; a Suggestion for Improving the	Thomas, W. Cave, late Captain 19th Middlesex Rifle Volunteers	XIII 54 143	1869
RED River Expedition, <i>with maps</i> .. ..	Huyshe, G. L., Capt. Rifle Bri- gade	xv 62 70	1871
REFORMS in Army Administration .. ..	De Fonblanque, E. B., Dep. C.-G.	XIII 53 88	1869
REGIMENTAL Officers, The Appointment and Promotion of	Robertson, A. Cunningham, Col. 8th Regt.	XII 49 192	1868
—— of the British Army, the Cultiva- tion of Scientific Knowledge by, <i>see</i> <i>Army</i> .			
REGISTERING the Angles of Rolling and Heeling, for the Information of the Construction Department of the Admiralty, Forms for, <i>illustrated</i>	Ryder, A.P., Rear- Admiral	xv 62 58	1871
RESERVE Forces, Our, <i>with map</i> .. ..	Malet, Lieut.-Col. Gren. Guards	XIII 54 160	1869
—— On the Best Practicable Method for Ensuring Efficiency in the Army, and for Obtaining an Effective and Reliable, having regard to the Existing Feeling in the Country on the Subject	Warde, Sir Edward C., K.C.B., Maj- Gen. R.A.	XIX 80 128	1875
—— Our First .. .. .	Fox, L. Loftus B., Capt. Royal Longford Rifles	XIII 53 1	1869
RESERVES, Infantry, Army Organization, our Infantry Forces and	Leahy, Arthur, Maj. R.E.	XII 50 310	1868
—— Naval, <i>see Naval Reserves</i> .			
—— of Officers and Seamen for the Royal Navy, The Formation of, and the Evils and Inadequacy of Impress- ment to provide the same	Gardner, G. H., Capt. R.N.	xv 65 601	1871
RETREAT of the Ten Thousand; a Military Study for all time, <i>with map</i>	Vaughan, J. L., C.B., Maj.-Gen.	XVIII 76 99	1874

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.*	Year.
RIFLED Ordnance, Heavy, The Construction of, <i>with plate</i>	Palliser, Major William, late 18th Hussars	Vol. XII No. P. 50 378	1868
RIFLES and Rifling, <i>with plates</i> .. ..	O'Hea, J.B., Capt. late 25th Regt.	XVII 72 356	1873
—— Breech-Loading, The Government of France, Prussia, and England, <i>with plate</i>	Drake, Mervin, Capt. R.E.	XV 64 438	1871
RIFLING, and Conversion of Cast-Iron Ordnance, and on Chilled White Iron Projectiles, <i>with plates</i>	Palliser, Maj. William	XI 44 149	1867
—— for Heavy Guns, <i>with illustrations</i> ..	Morgan, J. P., Capt. R.A.	XVII 74 648	1873
RIFLEMEN, Mounted, <i>see Mounted Riflemen</i> .			
ROGERS'S Life-Saving Apparatus, <i>with plate</i>	Rogers, J. B. ..	XIV 57 28	1870
ROLLING of a Ship in a Sea-way and the Contemporaneous Wave Slopes, Apparatus for Automatically Recording, <i>with plates</i>	Froude, William, M.A., F.R.S.	XVII 75 858	1873
ROYAL Navy; Is our Merchant Service any Longer a Feeder to the ?	Wilson, J.C., Capt. R.N.	XX 85 61	1876
—— Naval Reserve, Three Years with ..	Brent, H.W., Comr. R.N.	XVIII 78 358	1874
RUDDER, Jury, Explanation of a, invented by him, <i>with plate</i>	Commerell, Sir J. E., <del>B.C.</del> , K.C.B., Capt. R.N.	XIX 84 956	1875
—— The Fish-Tail, for all Classes of Vessels, <i>with plate</i>	Croft, J.M'Grigor, M.D.	XIV 57 40	1870
RULE of the Road at Sea, or the Steering and Sailing Rules, <i>with plate</i>	Lacon, W. Stirling	XVI 67 262	1872
RUSSIAN Army .. .. .	Vincent, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	XVI 67 285	1872
—— Army, Recent Reforms in .. ..	Clarke, F. C. H., Capt. R.A.	XX 86 373	1876
—— Campaign, the late, against Khiva, <i>with map</i>	Trench, F. Chenevix, Capt. 20th Huss.	XVIII 77 212	1874

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
RUSSIAN Ramming Diagrams, Presented to the Royal United Service Institution, A Statement to Accompany, <i>with plate</i>	Ryder, A.P., Vice-Admiral	Vol. No. P. XVIII 79 535	1874
——— Ships sunk in the Harbour of Sevastopol, Ship Raising, especially with Reference to his Experience in Raising, <i>with plates</i>	Gowen, John E., Colonel United States Army	XIII 55 348	1869
RUSSIA, The Strategy of, in Central Asia, from a Persian Point of View, <i>with map</i>	Smith, R. Murdoch, Capt. R.E.	XVII 71 212	1873
RUSSO-TURKISH Campaigns of 1828-29 in Europe and Asia, A Sketch of, <i>with maps</i>	Wilbraham, Sir Richard, Lieut.-Gen., K.C.B.	XX 88 692	1876
<b>S.</b>			
SANITARY Arrangements of Hospitals, Barracks, Camps, and Shipping, &c., Suggested Improvements in	Synge, Millington, Maj.-Gen. R.E.	XVIII 78 299	1874
——— Precautions for Troops, <i>see Troops.</i>			
SAVAGE Warfare, Experience in, <i>with map</i>	Baker, Sir Samuel White, Kt.	XVII 75 904	1873
——— <i>see Warfare, and Kafir.</i>			
SCIENTIFIC Questions, State, <i>see State.</i>			
SCHOOL for the Army, <i>see General Military School.</i>			
SCHOOLS, the Establishment of County Military Training; a Suggestion for Improving the Recruiting System	Thomas, W. Cave, late Captain 19th Middlesex Rifle Volunteers	XIII 54 142	1869
——— LEITFADEN für den Unterricht in der Dienstkenntniss auf den Königlichen Kriegsschulen— (Notice of Book)	Schnackenburg and Bartels	XX 88 761	1876
SCREW-SHIP Steerage, means of, and a Description of the Hydrostatic Steering Gear fitted on board H.M.S. "Achilles," with the Results of Experiments at Sea; also a Plan of Apparatus fitted on board the Turkish Ironclad "Fethi-Bulend," <i>with plates</i>	Inglefield, E. A., Rear-Admiral	XIV 57 52	1870
——— Line of Battle Ships, the Conversion of our, into Armoured Turret Ships <i>with plates</i>	Henwood, Chas. F.	XIII 54 181	1869

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
SCREW Propulsion, a New Adaptation of, <i>with plates</i>	Paynter, J. Aylmer, Rear-Admiral	Vol. No. P. XVIII 79 527	1874
SEAMEN of the Country, How Best to Improve and keep them up	BRASSEY, Thos., M.P.	xx 85 110	1876
— of the Fleet; their Training, and how the Employment of Marines Afloat in Peace Time affects them	Wilson, J. C., Capt. R.N.	xix 83 604	1875
SECTION Skirmishing, and Ride and Tie Patrolling	Jones, Lieut.-Col., <i>W.C.</i>	xvi 66 127	1872
SHELTER Tent, a Method of Converting the Regulation Bell Tent into a, with a New Arrangement for entrenching Tools, <i>with illustrations</i>	James, Wm., late 42nd Highlanders	xvi 67 183	1872
— Tent, Suggestions for a, <i>with plate</i>	Tulloch, Alexander B., Captain 69th Regt.	xvii 70 63	1873
— Trenches or Temporary Cover for Troops in Position, <i>with plates</i>	Graham, Gerald, Col., <i>W.C.</i> , C.B., R.E.	xiv 60 448	1870
SHIPS of War, (Modern) as Illustrated by the Models in the Institution, <i>with plates</i>	Barnaby, Nathaniel	xvi 66 58	1872
— of War, Circular, with Immersed Motive Power, <i>with plates</i>	Elder, John ..	xii 52 529½	1868
— of War, a new form of Ironclad, <i>with illustration</i>	Wheatley, John, Capt. R.N.	xv 64 476	1871
— Economy of Fuel in, <i>see Fuel</i> .			
— Armour-plated, Description of a Model of, as designed by him, <i>with illustration</i>	Wilson, Edmund, Capt. R.N.	xii 51 502	1868
SHIP-Raising, especially with Reference to his Experience in Raising the Russian Ships sunk in the Harbour of Sevastopol, <i>with plates</i>	Gowen, John E., Colonel United States Army	xiii 55 348	1869
SHIPS, Ventilation of, especially of Low Freeboard and Hospital Ships, <i>with plates</i>	Macdonald, J. D., M.D., R.N.	xviii 76 136	1874
— Lighting of H.M.'s., <i>see Lighting</i> .			
SHOEBURYNNESS, Summary of the Experiments at, during the year 1868-69	Mackie, Samuel J., Assoc. Inst. C.E.	xiii 55 301	1868

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
SHOT Plug, Expanding; Expanding Sponge for Artillery Practice and Anti-Torpedo Vessel, <i>with plates</i>	Gilmore, A. H., Lieut. R.N.	Vol. No. P. XIII 53 30	1869
SCHÜLTZE'S Granulated-wood Gunpowder..	Dougall, James D.	XII 48 127	1868
SICK and Wounded in War, aid to the ..	Loyd-Lindsay, R. J., Lieut.-Col., F.C., M.P.	XV 64 381	1871
———— Societies for aid to, &c. &c.	Furley, John ..	XX 88 632	1876
———— and Wounded Soldiers during the late Franco-Prussian War, &c., the Geneva Convention of 1864, in Re- lation to Aid afforded by Volunteer Societies to	Longmore, T., C.B., M.D.	XVI 67 206	1872
SIEGE of Paris, Personal Experiences and Reminiscences of the, <i>with plate, &amp;c.</i>	Wyatt, Surgeon- Major, Cold- stream Guards	XVII 71 157	1873
SIGHTS of Ordnance, Note on Aligning the, when laying for an Object, <i>with illus- tration</i>	Grenfell, H. H., Lieut. R.N.	XVII 74 746	1873
SIGNALLING, Military, and Telegraphy, <i>with plates</i>	Stotherd, R. H. Capt. R.E.	XIV 59 312	1870
SIGNALS, Fog, in Fleets, <i>with illustrations</i>	Brent, H. W., Comr. R.N.	XV 63 136	1871
———— Some Account of the Obser- vations recently made by the Corpora- tion of the Trinity House on, <i>with plates</i>	Collinson, Sir Richard, K.C.B., Vice-Admiral	XIX 82 65	1875
SIGNAL Lights of Captains Colomb and Bolton, <i>with plates</i>	Colomb, P. H., Comr. R.N.	XII 50 373	1868
SIKH and European Soldiers of our Indian Forces	Eyre, Vincent, Maj.-Gen. C.B., R.A.	XI 43 86	1867
SKETCHING, Military Improved Instru- ments for, <i>with illustrations</i>	Hutchinson, A. H., Maj. R.A.	XVII 70 65	1873
SKIRMISHING Line, Proposed Method of Attack in	Parker, F. G. S., Capt. 54th Regt.	XVII 74 741	1873
SMALL Arms, the progress of Breech- Loading, <i>with plates</i>	Latham, John ..	XIX 83 631	1875
———— Arms, Military Breech-Loading, <i>with plates</i>	Majendie, V. D., Capt. R.A.	XI 44 190	1867



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year
SOLDIERS' Unemployed Time, Utilization of	Sloane, Captain, Sherwood Foresters Militia	Vol. No. P. XII 48 1	1868
SÖRENSEN'S Norwegian Self-Acting Cooking Apparatus, <i>with illustration</i>	Sörensen, John ..	XII 49 292	1868
SPAKOWSKY Marine and Army Night-Telegraph	Doty, H. H., Capt.	XI 47 658	1876
SPANISH Armada, A Warning Voice from	Collinson, T. B., Maj.-Gen. R.E.	XIX 81 285	1875
—— Ships, Revolted in 1873, British Interference with	Dyer, Hugh M'Neil, Capt. R.N.	XVIII 77 283	1874
STABILITY, Insufficient, On the Causes of of H.M.'s late Turret Ship "Captain" and of other Ironclads, <i>with plates</i>	Fishbourne, E. Gardiner, Rear-Admiral, C.B.	XV 62 1	1871
STAFF, The Intelligence Duties of the, Abroad and at Home	Brackenbury, C.B., Maj. R.A.	XIX 81 242	1875
—— The Connection between the Ordinary Work of, in Peace-time and War-like Efficiency (Lecture to Officers of Volunteers)	Maurice, J. F., Lieut. R.A.	Special } No. } p.80	1873
—— Officers in Foreign Armies, The Practical Instruction of, <i>with map</i>	Burnaby, F. G., Capt. Roy. Horse Guards	XVI 68 633	1872
—— Officers, the Education of .. ..	Jones, Alfred S., Maj. U.C.	XIV 59 271	1870
STATE Scientific Questions, Permanent Commission on, <i>see Commission.</i>			
STEAM Steering Screw, Bremner's, <i>with illustration</i>	Bremner, Geo., Capt.	XVII 70 69	1873
STEAM-TRANSPORT Fleet (Naval), Necessity for an increase in	Hoseason, J. C., Capt. R. N.	XIV 61 530	1870
STEENSTRÜP'S Conical Screw and Breech-Loading Cannon, <i>with plate</i>	Jensen, Peter ..	XIV 57 124	1870
STEERING Apparatus, Inglefield's New Hydraulic, as being fitted to H.M.S. "Achilles," <i>with plate</i>	Inglefield, E. A., Capt. R.N.	XIII 53 22	1869
STERN and Bow-Screw Steamships, <i>with plates</i>	Griffiths, R., C.E.	XVII 74 734	1873
—— and Bow, Screw Propeller, Further Experiments with his, <i>with plate</i>	„ „	XVIII 77 157	1874

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
		Vol. Na. P.	
STORM and Signal Lights, Holmes's <i>with illustration</i>	Holmes, Nathaniel	XVI 66 24	1872
STORMS in the British Islands, and Telegraphic Weather Intelligence, <i>with plate</i>	Scott, Robert H.	XIII 54 287	1869
STRATEGY of Russia in Central Asia, from a Persian Point of View, <i>see Russia</i> .			
—— of Invasion, as exemplified in the American and Austro-Prussian Wars and in the War of Metz, with Remarks on Centres of Defence and the Training of National Forces	Adair, R.A. Shafto, Col.	XVI 67 153	1872
STUART's Breech-Loading Cannon, <i>with plate</i>	Stuart, Graham, Capt. 4th W. Y. Artil. Volunteers	XIV 57 19	1870
STUDY, Scientific, of Naval History ..	Laughton, J. K., R.N.	XVIII 79 508	1874
SUBMARINE Warfare, Defensive, <i>with plates</i> .	Stotherd, R. H. Maj. R.E.	XV 65 705	1871
SUPPLY in India, <i>see Transport</i> .	.. ..	..	
SURVEYING, Practical Nautical, <i>with plates</i>	Hull, T. A., Staff Comr. R.N.	XVI 69 701	1872
—— An Occasional Note on the Use of the Aneroid Barometer in	Fawcett, R. H. Capt. 33rd Regt.	XVI 66 143	1872
SWISS Military System .. ..	Martini and Hotze	XV 64 508	1871
<b>T.</b>			
TACTICS, Naval, a New System of, <i>with plate, &amp;c.</i>	Bower, Graham, Lieut. R.N.	XIX 82 502	1875
—— of the Three Arms, as Modified to Meet the Requirements of the Present Day, <i>with plate</i>	Brackenbury, H., Capt. R.A.	XVII 74 618	1873
—— Changes of, consequent on the Improvement of Weapons, &c.	Middleton, F., Lt.-Col.	Special } No. } p. 1	1873
—— Naval, <i>with plates</i> .. ..	Inglefield, E. A., Capt. R. N.	XII 51 483	1868
—— Naval, Fleet Evolutions .. ..	Bridge, Cyprian A. G., Comr. R.N.	XVII 227	1873

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
TACTICS, Military, and Formation in Germany, A Review of the Improvements in, during the last year (1873), being a précis of an Article from the "Militaire Wochenblatt"	Ouvry, H.A., Col., C.B.	Vol. No. P. XVIII 78 441	1874
— Infantry of the Day, Proposed Alterations in the Annual Musketry Practice, so as to bring it into accordance with the, <i>with illustrations</i>	Brooke, Chas. K., Capt. 15th Regt.	XIX 80 22	1875
— Naval, The Game of, <i>with plates</i>	Castle, W. M. F., Lieut. R. N.	XVII 75 786	1873
— The New French Infantry ..	Hale, Lonsdale A., Maj. R.E.	XX 87 578	1876
— The Gatling Gun; its Place in, <i>with illustrations</i>	Rogers, E., Capt.	XIX 82 419	1875
— Infantry .. .. .	Williams, W. J., Col. R.A.	XVI 69 768	1872
— Ancient Naval, <i>see Ancient Naval Tactics.</i>			
TACTICAL Examples .. .. .	Helvig, Hugo ..	XX 86 389	1876
— Formation of our Infantry; Is a Radical Change in, Really Necessary?	Thesiger, Hon. Frederic, Col., C.B.	XVII 73 411	1873
— Power of Modern Field Artillery ..	Brackenbury, C.B. Lieut.-Col. R.A.	XX 86 310	1876
TARGET for Eye-Training, <i>with illustration</i>	Poore, F.H. Capt. R.M.A.	XVII 73 309	1873
TELEGRAPH Cables, The Atlantic, of 1857-58, also those of 1865-66	Moriarty, H. A., Staff - Comr., R.N., C.B.	XI 44 127	1867
TELEGRAPHY and Signalling, Military, <i>with plates</i>	Stotherd, R. H., Capt. R.E.	XIV 59 312	1870
TENT, Suggestions for a Shelter, <i>see Shelter Tent.</i>			
— Bell, A Method of Converting the Regulation into a Shelter Tent, with a New Arrangement for Entrenching Tools, <i>with illustration</i>	James, Wm., late 42nd Highlanders	XVI 67 183	1872
TEN Thousand, The Retreat of the; a Military Study for all time, <i>with map</i>	Vaughan, J. L., C.B., Maj.-Gen.	XVIII 76 99	1874

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
TIME, Unemployed, Utilization of the Soldiers' ; A Proposed Scheme Independent of Government Supply ; also a Plan for Regimental Charities	Sloane, Captain, Sherwood Foresters Militia	Vol. No. P. XII 48 1	1868
THRASYMENE, Note on the Battle of, <i>with plate</i>	Napier, the late Sir Chas. J., G.C.B., Lt.-Gen.	XVIII 78 439	1874
TORPEDO Warfare, Offensive, <i>with plates</i> ..	Dawson, Wm., Comr. R.N.	XV 62 86	1871
—— Chinese, Description of a Model of	Beal, Rev. S., R.N.	XV 75 728	1871
—— Boats, "Fortune" and "Triana," United States Navy, Description of, <i>with plate</i>	Bucknill, J. T., Lieut. R. E.	XVII 73 239	1873
TORPEDOES, Plan for Protecting Ships (at anchor) Blockading a Port from Attacks by Outrigger, Whitehead, or Harvey, <i>with plate</i>	Lindsay, Charles, Lieut. R.N.	XIX 82 528	1875
TRAINING, Military, a Means of Administrative Power, and of Political Usefulness	Goldsmid, Sir Frederic J., Major - General, C.B., K.C.S.I.	XX 87 524	1876
—— Schools, Military, The Establishment of County ; a Suggestion for Improving the Recruiting System	Thomas, W. Cave, late Captain 19th Middlesex	XIII 54 143	1869
—— Boys for Soldiers .. ..	Magregor, John	XIX 82 3 9	1875
TRINITY House, Some Account of the Observations recently made by the Corporation of the, on Fog Signals, <i>with plates</i>	Collinson, Sir Richard, K.C.B., Vice-Admiral	XIX 82 465	1875
TRANSPORT Fleet, Naval, The Necessity for an Increase in our, for Military Purposes, <i>with map</i>	Hoseason, J. C., Capt. R.N.	XIV 61 530	1870
—— Military, and Supply in India ..	Collen, E. H. H., Lieut. R.A.	XVI 68 477	1872
—— Military .. ..	Wingfield, F., Dep. Asst. C.-G.	XIII 54 263	1869
TROOPS in Tropical Regions, &c., Sanitary Precautions to be observed in the Moving and Camping of	Maclean, W. C., M.D., C.B., Surgeon-General	XVIII 76 114	1874
TURBINE Propeller, <i>with plate</i> .. ..	Murray, [Andrew, C.B.	XV 65 643	1871

SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
TURKESTAN and India, Certain Roads between, independent of the Oxus or of any Oxus Boundary, <i>with map</i>	Goldsmid, Sir Frederic J., Col., C.B., K.C.S.I.	Vol. No. P. XVIII 79 469	1874
TURKISH Forces, The, and the Military Aspects of the Eastern Question	Vincent, C. E. H., Lieut.-Col. Central London Rifle Rangers	xx 86 346	1876
TURRET, The, <i>versus</i> the Broadside System, <i>with plates</i>	Coles, Cowper, P., Capt. R.N., C.B.	xi 46 434	1867
——— Ships, Armoured, The Conversion of our Screw Line of Battle Ships into, <i>with plates</i>	Henwood, Chas.F.	xiii 54 181	1869
<b>U.</b>			
UMBRELLA Campaign, The, <i>with plate</i>	Fosbery, G. V., Maj., <del>B.C.</del> , H.M. Bengal Staff Corps	xi 47 548	1867
UNSURVEYED World, The, in 1874, <i>with map</i>	Hull, T. A., Staff-Comr.	xix 80 48	1875
<b>V.</b>			
VANCOUVER's Island and British Columbia, Report of a Reconnaissance of the North-West Provinces and Indian Territories of the Dominion of Canada, and Narrative of a Journey across the Continent through Canadian Territory to	Robertson-Ross, P., Col.	xvii 74 543	1873
VENTILATION of Ships, especially of Low Freeboard and Hospital Ships, <i>with plates</i>	Macdonald, J. D., M.D., Staff-Surgeon R.N.	xviii 76 136	1874
VERSAILLES, The position and Lines of Defence of the 5th Corps before, during the Winter of 1870-71	Walker, Beauchamp, Major-Gen., Military Attaché, Berlin	xv 65 806	1871
"VICTOR Emanuel," H. M. S., as an Hospital Ship during the late Ashantee Campaign, <i>with plate</i>	Ryder, A. P., Vice-Admiral	xviii 78 383	1874
VOLTA Expedition, The, during the Ashanti Campaign, <i>with map</i>	Glover, Sir John H., G.C.M.G., Capt. R.N.	xviii 78 317	1874
VOLUNTEERS, The recent War, with reference to (Special Lecture to Officers of Volunteers)	Home, R., Capt. R.E., &c.	Special } No. } p.61	1873



SUBJECT OF LECTURE OR PAPER.	NAME OF AUTHOR.	Vol., No., and Page of Journal.	Year.
<b>W.</b>			
WAR. Vessels for the British Navy, The Best Types of.—(The Naval Prize Essay, 1876), <i>with plates</i>	Noel, Gerald N., Comr. R.N.	xx 86 253	1876
WAR-FORCES, Distribution of, <i>see Forces</i> .			
WARFARE, Defensive Submarine, <i>with plate</i>	Stotherd, R. H., Maj. R.E.	xv 65 705	1871
———— Savage, Experience in, <i>with map</i> .	Baker, Sir Samuel White, Kt.	xvii 75 904	1873
———— and British Troops, with Special Reference to the Kaffir Wars, <i>with map</i>	Gawler, Col., late 73rd Regt.	xvii 75 922	1873
———— Primitive, Section I., <i>with plates</i> .	Fox, A. H. Lane, Col. late Grenadier Guards	xi 47 612	1867
———— Section II. ; on the Resemblance of the Weapons of Early Races, their Variations, Continuity, and Development of Form, <i>with plates</i>	” ”	xii 51 399	1868
———— Section III. ; Metal Period, <i>with map and plate</i>	” ”	xiii 56 509	1869
WARNING Voice from the Spanish Armada, <i>see also Spanish Armada</i> .	Collinson, T. B. Maj.-Gen. R.E.	xix 81 285	1875
———— Voice, Another, from 1805, <i>with map</i>	” ”	xx 85 1	1876
WEATHER Intelligence and Storms in the British Islands, Telegraphic, <i>with plate</i>	Scott, Robert H.	xiii 54 287	1869
WHITE'S Porte-Knapsack, <i>with illustration</i>	White, Wm., ..	xvi 69 747	1872
WINDS of the North Atlantic, <i>with plates</i>	Toynbee, H., Capt.	xv 64 567	1871
WORLD, Unsurveyed, The, 1874, <i>with map</i>	Hull, T. A., Staff- Comr. R.N.	xix 80 48	1875
WÖRTH, The Battle of, <i>with maps</i> ..	Collen, E. H. H., Lieut. R.A.	xvii 73 426	1873
WOUNDED in War, Aid to the Sick and ..	Loyd-Lindsay R. J., Lieut.-Col., U.C., M.P.	xv 64 381	1871
———— Societies for aid to	Furley, John ..	xx 88 632	1876
———— in time of War, Assistance to the, <i>with illustrations</i>	Moore, Sandford, Surgeon, M.B.	xx 88 658	1876
WRECKS, The Destruction of, under Water,	Jekyll, Herbert, Lieut. R.E.	xiii 55 395	1869

# INDEX OF AUTHORS.

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. and No. of Journal.	Year.
<b>A.</b>			
ABEL, F. A., F.R.S.	Explosive Agents applicable to Naval and Military Purposes as Substitutes for Gunpowder	XVI. 68	1872
ABNEY, W. de W., Capt. R.E. (School of Military Engi- neering, Chatham)	On Magneto-Electric Light .. ..	XX. 86	1876
ADAIR, R. A. Shafto, Col. F.R.S., A.D.C. to the Queen	The Communications, Commercial and Military, between the Steppes of Central Asia and Hindustan	XI. 45	1867
” ”	The Strategy of Invasion, as exemplified in the American and Austro-Prussian Wars and in the War of Metz, with Remarks on Centres of Defence and the Training of National Forces	XVI. 67	1872
ADAMS, A. Leith, M.D., Surg.-Major London Recruiting District	The Recruiting Question, from a Military and a Medical point of View	XVIII. 76	1874
AIKMAN, F. R., Lt.- Col., G.C.	Aikman's Instruction-Rifle and Prac- tice Tester for Ordnance	XV 117	1871
ANDREW, W. P., F.R.G.S.	The Euphrates Valley Route to India, in connection with the Central Asian Question	XVII 324	1873
ARDAGH, J. C., Capt. R.E., F.R.G.S.	The Comparative Cost of the Armies of different Nations, and the Loss to a Country by Conscription	XX 128	1876
ARTHUR, Capt., R.N.	Description of a Registering Compass ..	XIV 257	1870

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
<b>B.</b>			
BAILLIE, J., Lt.-Col. H.M. Bengal Staff Corps	Photography applied to Military Science	XIII. 56	1869
BAKER, Valentine, Col., late 10th Hussars	Organization and Employment of Cavalry, with Discussion on ditto	XVII. 73	1873
„ „	The Military Geography of Central Asia	XVIII. 79	1874
BAKER, Sir Samuel White, Pacha, M.A. F.R.S., F.R.G.S.	Experience in Savage Warfare .. ..	XVII. 75	1873
BALE, Lieut. 1st W. I. Regt.	Extracts from a Report on Orange Walk, New River, as a Military Position for the Protection of British Interests in Honduras, with Notes and Experiences on Out-Post Duty in the Bush	XVII. 75	1873
BALFOUR, G., Maj.- Gen. R.A., C.B.	The Constitution, Composition, and Recruiting of the French Army	XI. 47	1867
BARNABY, Nathaniel, Assist.-Constructor of the Navy	Modern Ships of War as Illustrated by the Models in the Institution	XVI. 66	1872
BARNABY, Nathaniel, Chief Naval Con- structor Admiralty	Lessons from the Hotspur-Glatton Experiments	XVII. 72	1872
BARTELS, <i>see</i> SCHNACKENBURG.			
BEAL, Rev. S., R.N.	Description of a Model of a Chinese Torpedo	XV. 65	1871
BEAZLEY, G. G., Capt. 83rd Regt.	Suggestions for the Land Transport-Service of the Army	XIII. 56	1869
BEAZLEY, Alex. ..	Coast Fog-Signals. . . . .	XVI. 69	1872
BELL, T. Lynden, Major 1st Batt. 6th Regt.	Movements, &c., of Light Infantry ..	XIV. 61	1870
BESSEMER, H. ..	On the Accurate Firing of Naval Ordnance by means of the Vessel's Motion	XVII. 75	1873
BEVAN-EDWARDS, G., Major R.E.	An Organization for the Army of England	XII. 50	1868

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
BIGGE, T. S., Major 5th Fusiliers	Proposed Formation of a Battalion for the Attack	XVIII. 76	1874
BLAKE, G. Frederic, Captain R.M.	Military Law .. .. .	XI. 47	1867
BLOM, T. A., Chief Constructor, Nor- wegian Navy	Practical Method of Finding a Ship's Metacentre at great Angles of Inclination	XVII. 73	1873
BOWER, Graham, Lieut. R.N.	A New System of Naval Tactics ..	XIX. 82	1875
BOYLE, R. H., Com- mander R.N.	H.M. Ship Agincourt on and off the Pearl Rock	XVI. 67	1872
BRACKENBURY, H., Capt. R.A. (Pro- fessor of Military History, Royal Mi- litary Academy, Woolwich	The Last Campaign of Hanover. . .	XIV. 58	1870
" "	The Tactics of the Three Arms, as Modi- fied to Meet the Requirements of the Present Day	XVII. 74	1873
BRACKENBURY, C. B., Capt. R.A.	The Military Systems of France and Prussia in 1870	XV. 63	1871
" "	The Winter Campaign of Le Mans ..	XV. 64	1871
" "	The Autumn Manœuvres of England ..	XVI. 67	1872
" "	Autumn Manœuvres of 1872 .. ..	XVII. 71	1873
BRACKENBURY, C. B., Major R.A.	The Intelligence Duties of the Staff Abroad and at Home	XIX. 81	1875
BRACKENBURY, C. B., Lt.-Colonel R.A., A.A.G., G.O.G.I.	The Tactical Power of Modern Field Artillery	XX. 86	1876
BRASSEY, Thos., M.P.	Naval Reserves .. .. .	XVII. 73	1873
" "	How Best to Improve and Keep up the Seamen of the Country .	XX. 85	1876
" "	The Mercantile Marine considered as an Auxiliary to the Royal Navy	XX. 87	1876
BREMNER, Geo., Capt.	Bremner's Steam Steering Screw ..	XVII. 70	1873
BRENT, H. W., Com. R.N.	Fog Signals in Fleets .. .. .	XV. 68	1871

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
BRENT, H. W., Com. R.N.	Three Years with the Royal Naval Reserve	XVIII. 78	1874
BRIDGE, Cyprian A. G., Comr. R.N.	Fleet Evolutions and Naval Tactics ..	XVII. 72	1873
„ „	An Account of the Chinese Naval Arsenal at Foo-chow, Translated and Abridged from M. Giquel's Pamphlet	XX. 88	1876
BROOKE, Chas. K., Capt. 15th Regt.	Proposed Alterations in the Annual Musketry Practice, so as to bring it into accordance with the Infantry Tactics of the Day	XIX. 80	1875
BROWNE, C. Orde-, see ORDE-BROWNE			
BROWNE, Edmond, Capt. 21st Royal N. B. Fus.	Upper Burmah, its Defences and War-like Resources	XIX. 83	1875
BUCKNILL, J. T., Lieut. R.E.	Propositions in connection with Diving Apparatus	XV. 65A	1871
„ „	Description of the Torpedo Boats "Fortune" and "Triana," United States Navy	XVII. 73	1873
BURNABY, F.G., Capt. Roy. Horse Guards	The Practical Instruction of Staff Officers in Foreign Armies	XVI. 68	1872
C.			
CAMPBELL, George, Bengal Civil Service	The North-West Frontier of India ..	XIII. 54	1869
CAMPBELL, J. R., Capt. Hants Militia Artillery	Campbell's Range-Indicator ..	XVI. 67	1872
„ „	Erratum ditto ditto ..	XVI. 68	1872
CARMICHAEL, L. M., Capt. 5th Royal I. Lancers	Artillery Fire in Peace Manœuvres ..	XVIII. 78	1874
CARPENTER, William, M.D., LL.D., F.R.S.	The Voyage of H.M.S. Challenger ..	XVII. 75	1873
„ „	Ditto ditto continued	XIX. 84	1875
CASTLE, W. M. F., Lieut. R.N.	The Game of Naval Tactics ..	XVII. 75	1873



NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
CHADWICK, Edwin, C.B.	The military and naval Force derivable from the Introduction of Military Drill and Gymnastic Exercises, as part of a National System of Education into all Elementary Schools	XIV. 59	1870
CHAUMONT, see DE CHAUMONT			
CHESNEY, C. C., Lt.- Col. R.E.	The Study of Military Science in time of Peace	XV. 63	1871
„ „	The Theory and Practice of Peace-Manœuvres, with their Relation to Real Warfare	XVI. 68	1872
CLANCHY, H. T., Lieut. R.N.	Our Naval Officers and the Public Services: Proposed Employment of Her Majesty's Ships and Naval Officers in connection with the Mail and Troop Services combined	XV. 65	1871
CLARKE, Hyde ..	The Military Advantages of a Daily Mail Route to India through Turkey and the Persian Gulf	XII. 49	1868
CLARKE, E. Podmore, Capt.	Military Model Apparatus .. ..	XIX. 84	1875
CLARKE, F. C. H., Captain R. A., D.A.Q.M.G.	Recent Reforms in the Russian Army ..	XX. 86	1876
CODRINGTON, Sir Wil- liam J., Gen., G.C.B.	Autumn Manœuvres Abroad and at Home, 1869-70	XVI. 68	1872
COLES, Capt. Cowper P., C.B., R.N.	The Turret <i>versus</i> the Broadside System	XI. 46	1867
COLLEN, E. H. H., Lieut. R.A.	On Military Transport and Supply in India	XVI. 68	1872
„ „	The Battle of Wörth .. ..	XVII. 73	1873
COLLEY, G. P., Major 2nd Queen's, Pro- fessor of Military Administration and Law, Staff College, Sandhurst	Marches .. ..	XVII. 70	1873
COLLINSON, T. Ber- nard, Col. R.E.	A Proposition for one General Military School for the Army	XIII. 54	1869
COLLINSON, T. B., Maj.-Gen. R.E.	The Strategical Importance of the Military Harbours in the British Channel as connected with Defensive and Offensive Operations	XVIII. 77	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
COLLINSON, T. B., Maj.-Gen. R.E.	A Warning Voice from the Spanish Armada	XIX. 81	1875
" "	Another Warning Voice from 1805 ..	XX. 85	1876
" Sir Richard, Vice-Admiral, K. C. B., (Elder Bro- ther of the Trinity House)	Some Account of the Observations recently made by the Corporation of the Trinity House on Fog Signals	XIX. 82	1875
COLOMB, P. H., Com- mander R.N.	Lessons from Lissa .. ..	XI. 43	1867
" "	The Naval Department of the French International Exhibition of 1867	XII. 48	1868
" "	The Earl of Caithness's Gravitating Compass, and Nunn's Improved Bin- nacle Lights	XII. 49	1868
" "	Signal Lights of Captains Colomb and Bolton	XII. 50	1868
COLOMB, P. H., Capt. R.N.	The Attack and Defence of Fleets, Pt. I.	XV. 64	1871
" "	Ditto ditto Part II.	XVI. 66	1872
" "	The Lighting of H.M. Ships .. ..	XVI. 68	1872
COLOMB, J. C. R., Capt. Royal Marine Artillery	The Distribution of our War Forces ..	XIII. 53	1869
" "	General Principles of Naval Organiza- tion	XV. 64	1871
" "	Ditto Military Organization	XV. 64	1871
COMMERELL, Sir J. E., U.C., K.C.B., Capt. R.N.	Explanation of a Jury-Rudder invented by him	XIX. 84	1875
COODE, Sir John, Kt., C.E.	On Military or Strategic and Refuge Harbours	XIX. 81	1875
CROFT, J. M'Grigor, M.D., M.R.C.P.	The Fish-Tail Rudder for all Classes of Vessels	XIV. 57	1870
CROUDACE, W. S., Mercantile Marine	Croudace's New Book of Stellar Azimuth Tables; a Newly-Invented Illu- minated Stellar Azimuth Compass; and Croudace's Ordnance Night Sight- Vane or Collimator	XVIII. 77	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
CUNNINGHAM, H. D. P., Major 3rd Hants Artillery Volunteers	Working Heavy Guns and Projectiles ..	XIV. 57	1870
CUNYNGHAME, Sir A., General, K.C.B.	The Eastern Caucasus and Daghestan ..	XVII. 75	1873
D.			
DAVIDSON, D., Lieut.- Colonel	The Use of the Collimator for Laying Guns for Night Firing	XIII. 55	1869
DAVIS, J. E., Capt. R.N.	Extracts from a Paper read at the British Association for the Advance- ment of Science, at Bradford, on the Scientific Voyage of the "Challenger"	XVII. 75	1873
DAWSON, Wm., Comr. R.N.	Offensive Torpedo Warfare .. ..	XV. 62	1871
" "	Naval Guns .. ..	XVI. 68	1872
" "	On Mounting and Working Heavy Guns at Sea	XVI. 68	1872
" "	Powder Pressures in the first 35-ton Gun	XVII. 70	1873
DE CHAUMONT, F., M.D., Army Medi- cal School, Netley	Military Hygiene .. ..	XIV. 59	1870
DE FONBLANQUE, E. B., Deputy Com- missary-General	Reforms in Army Administration ..	XIII. 53	1869
" "	The Control Service, with Practical Sug- gestions for its Improvement, &c.	XVI. 66	1872
DILLON, Conrad A., Capt.	The Chobham Bedstead .. ..	XVI. 66	1872
DOTY, H. H., Capt...	The Spakowsky Marine and Army Night-Telegraph	XI. 47	1867
DOUGALL, James D.	Shültze's Granulated-wood Gunpowder	XII. 48	1868
DRAKE, Mervin, Capt. R.E.	The Government Breech-Loading Rifles of France, Prussia, and England	XV. 64	1871
DREW, Andrew A.W., M.A.	The Working of Heavy Broadside Guns	XI. 43	1867
DYER, Hugh M'Neil, Capt. R.N.	British Interference with Revolted Spanish Ships in 1873	XVIII. 77	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
<b>E.</b>			
EAST, C. J., Brevet-Major 41st Regt.	An Account of the Proceedings of the Chittagong Column of the Lushaie Expeditionary Force 1871-72	XVII. 71	1873
ECKERSLEY, E., Chief Engineer R.N.	Methods of Ascertaining the Relative Value of Coals for Naval Purposes	XIX. 84	1875
EDDY, Charles B., M.A.	Moveable Steel Mantlet for the Protection of Artillery and Troops	XIII. 55	1869
EDWARDS, see BEVAN-EDWARDS			
ELDER, John ..	Circular Ships of War, with Immersed Motive Power	XII. 52	1868
ELLIOT, G., Vice-Admiral	The Hydraulic Propeller as a Motive Power for Ships	XI. 47	1867
ENGLISH, T., Lieut. R.E.	Observations on the Moncrieff System of Mounting Ordnance	XVII. 74	1873
EVANS, F. J., Staff Capt. R.N., F.R.S.	The Present State of our Knowledge regarding the Magnetism of Iron Ships	XVI. 66	1872
EYRE, Vincent, Maj.-General, C.B., R.A.	The Sikh and European Soldiers of our Indian Forces	XI. 43	1867
<b>F.</b>			
FAWCETT, R. H., Capt. 33rd Regt.	An Occasional Note on the Use of the Aneroid Barometer in Surveying	XVI. 66	1872
FINDLAY, A. G., F.R.G.S.	Ocean Currents and their Influences ..	XIV. 58	1870
FISHBOURNE, E. Gardiner, Rear-Admiral, C.B.	On the Causes of the Insufficient Stability of H.M.'s late Turret Ship "Captain" and of other Ironclads	XV. 62	1871
FISHER, Colonel A. a'Court, C.B., R.E.	Gun-Cotton applied to Demolitions ..	XIV. 60	1870
FLETCHER, H. C., Lt.-Colonel Scots Fusilier Guards	The Employment of Mitrailleurs during the Recent War and their Employment in Future Wars	XVI. 66	1872
FOLKARD, A., M.I.C.E.	Improvements in Apparatus for Lowering and Raising, Engaging and Disengaging Ships' Boats	XVIII. 77	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
FONBLANQUE, see DE FONBLANQUE			
FOSBERY, G. V., Maj., F.C., H.M. Bengal Staff Corps	The Umbeyla Campaign .. ..	XI. 47	1867
" "	Explosive Bullets and their Application to Military Purposes	XII. 48	1868
" "	Mitrailleurs and their Place in the Wars of the Future	XIII. 56	1869
FOX, A. H. Lane, Colonel late Grenadier Guards	Primitive Warfare, Section I. .. ..	XI. 47	1867
" "	" " Section II.; on the Resemblance of the Weapons of Early Races, their Variations, Continuity, and Development of Form	XII. 51	1868
" "	" " Section III.; Metal Period	XIII. 56	1869
FOX, L. Loftus B., Capt. Royal Long- ford Rifles	Our First Reserve .. ..	XIII. 53	1869
FOX, T. W., Surgeon- General R.E.	The Medical Department of the German Army in Peace and War	XX. 87	1876
FROUDE, William, M.A., F.R.S.	Apparatus for Automatically Recording the Rolling of a Ship in a Sea-way and the Contemporaneous Wave Slopes	XVII. 75	1873
FURLEY, John ..	The Convention of Geneva and National Societies for Aid to Sick and Wounded Soldiers in War	XX. 88	1876
G.			
GARDNER, G. H., Capt. R.N.	The Formation of Reserves of Officers and Seamen for the Royal Navy, and the Evils and Inadequacy of Impress- ment to provide the same	XV. 65	1871
GATLING, R. J. ..	Machine Guns:—the Gatling Battery, the Agar and Claxton Guns, the French and Montigny Mitrailleurs	XIV. 60	1870
GAWLER, Col., late 73rd Regt.	British Troops and Savage Warfare, with Special Reference to the Kaffir Wars	XVII. 75	1873
GILMORE, A. H., Lieut. R.N.	Expanding Shot Plug; Expanding Sponge for Artillery Practice and Anti-Torpedo Vessel	XIII. 53	1869



NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
GILMORE, A. H., Commander R.N.	Gilmore's Safety Lamps for Mines and Ships	XIV. 59	1870
GLOVER, Sir John H., G.C.M.G., Capt. R.N.	The Volta Expedition during the Ashanti Campaign	XVIII. 78	1874
GOLDSMID, Sir Frederic J., Colonel, C.B., K.C.S.I.	Certain Roads between Turkestan and India, independent of the Oxus or of any Oxus Boundary	XVIII. 79	1874
GOLDSMID, Sir Frederick J., Major-Gen., C.B., K.C.S.I.	Journeys from Herat to Khiva .. ..	XIX. 80	1875
" "	Military Training, a Means of Administrative Power and of Political Usefulness	XX. 87	1876
GOODE, Samuel ..	Mance's Heliograph, or Sun Telegraph..	XIX. 83	1875
GOODENOUGH, James G., Capt. R.N.	The Preliminary Education of Naval Officers	XV. 64	1871
GOWEN, John E., Col. United States Army	Ship Raising, especially with Reference to his Experience in Raising the Russian Ships sunk in the Harbour of Sevastopol	XIII. 55	1869
GRAHAM, Gerald, F.C., C.B., Col. R.E.	Shelter Trenches or Temporary Cover for Troops in Position	XIV. 60	1870
GRAHAM, Sir Lumley, Bart., Col.	The Company as a Military Body; its Establishment, and the Best Number of Companies in the Battalion	XIX. 83	1875
" "	The Austrian Army in 1875 .. ..	XX. 87	1876
GRENFELL, H. H., Lieut. R.N.	Note on Aligning the Sights of Ordnance when Laying for an Object	XVII. 74	1873
GRIFFITHS, R., C.E.	Bow and Stern Screw Steamships ..	XVII. 74	1873
" "	Further Experiments with his Bow and Stern Screw Propeller	XVIII. 77	1874
" "	On the Casing of the Propeller of H.M.S. "Bruiser"	XX. 86	1876
" "	On the Best Method of Propelling Steam Ships, so as to give the Greatest Facility for Manœuvring in Action, and for Avoiding Collisions at Sea	XX. 88	1876
GUN, H. A., Captain R.E.	Manteuffel's Campaign in the East of France	XVII. 72	1873

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
<b>H.</b>			
HALE, Lonsdale A., Major R.E. (In- structor in Military History, Naval En- gineer Establish- ment, Chatham)	The Study of Military History by the Regimental Officers of the Army	XX. 87	1876
” ”	The New French Infantry Tactics ..	XX. 87	1876
HAMILTON, J. Ran- dolph (late C. S. Navy)	The American Navy; its Organization, Ships, Armament, and Recent Ex- periences	XII. 49	1868
HAMILTON, Mark, B.A., M.D., Sur- geon R.N.	Improved Life-Buoys, and a System of Deck-Rafts for Saving Life at Sea	XVII. 74	1873
HARCOURT, Vernon, Esq., Q.C., M.P.	Our Naval and Military Establishments regarded with reference to the Dan- gers of Invasion	XVI. 68	1872
HAY, Sir John C. D., Bart., C.B., M.P., F.R.S.	The Launch of H.M.S. “Northumber- land”	XIII. 56	1869
HEATHORNE, T. B., Capt. (h.p.), R.A.	Muzzle-Pivoting Gun-Carriages; Lever, Fulcrum, and Incline Plane Principle	XII. 49	1868
HELVIG, Hugo ..	Tactical Examples .. ..	XX. 86	1876
HENWOOD, Charles F., Naval Architect	The Conversion of our Screw Line of Battle Ships into Armoured Turret Ships	XIII. 54	1869
” ”	Ironclads, Present and Future .. ..	XIV. 58	1870
HILDYARD, H., Lieut. 72nd Highlanders	The Autumn Manœuvres of the Prussian Guard Corps in September, 1872	XVI. 69	1872
HILL, E. J. .. ..	Hill's Boat Lowering and Self-Detach- ing Apparatus	XVI. 69	1872
HIME, H. W. L., Capt. R.A., F.S.S. (R. A. Institution Gold Medallist)	Universal Conscription the Only Answer to the Recruiting Question.—(The Institution's Military Prize Essay, 1875)	XIX. 80	1875
HOLMES, Nathaniel, Electrical Engineer	Holmes's Storm and Signal Lights ..	XVI. 66	1872
HOME, R., Captain, R.E.	The recent War, with reference to the Militia and Volunteers (Lecture to Officers of Volunteers)	Special No.	1873
” Lieut.-Col., C. B., R. E., D.A.Q.M.G.	On the Organization of the Communica- tions of an Army, including Railways	XIX. 82	1875

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
HOPKINS, Evan, C.E., F.G.S.	The Demagnetization of Iron Ships and of Iron Beams, &c., of Wooden Vessels, to Prevent the Deviation of the Com- passes, Experimentally Shown by means of a Model	XI. 44	1867
HOSEASON, J.C., Capt. R.N.	The Necessity for an Increase in our Naval Steam Transport Fleet for Military Purposes	XIV. 61	1870
HOTZE, see MARTINI.			
HOWLETT, Samuel B. (late War Office)	Construction of Boots and Shoes Suit- able for the Army, Police, and others subject to Severe Walking	XII. 48	1868
HOZIER, H. M., Capt.	The Employment of Cavalry in War ..	XVI. 67	1872
„ „	The Breeding of Horses for Military Purposes	XVI. 69	1872
HULL, T. A., Staff Commander R.N.	Practical Nautical Surveying .. ..	XVI. 69	1872
HULL, T. A., Staff Commander R.N. (Superintendent of Charts, Admiralty)	The Unsurveyed World in 1874 ..	XIX. 80	1875
HUTCHINSON, W. N., Lieut.-General	A Light Short Gun, throwing a Heavy, Sharp - Edged, Discoidially - Formed Projectile	XI. 43	1867
„ „	Recoil Utilized .. ..	XIII. 53	1869
HUTCHINSON, A. H., Major R. A., F.R.G.S., &c.	Improved Instruments for Military Sketching	XVII. 70	1873
HUYSE, G. L., Capt. Rifle Brigade	The Red River Expedition .. ..	XV. 62	1871
HYDE, J. M.. ..	Deflecting Armour - Plated Ships for Coast Defence	XIII. 53	1869
I.			
INGLEFIELD, E. A., Capt. R.N., F.R.S.	Naval Tactics .. ..	XII. 51	1868
„ „	Inglefield's New Hydraulic Steering Apparatus, as being fitted to H.M.S. "Achilles"	XIII. 53	1869

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
INGLEFIELD, E. A., Rear-Adml., F.R.S.	Means of Screw-Ship Steerage, and a Description of the Hydrostatic Steering Gear fitted on board H.M.S. "Achilles," with the Results of Experiments at Sea; also a Plan of Apparatus fitted on board the Turkish Ironclad "Fethi-Bulend"	XIV. 57	1870
INNES, Alex., Major Aberdeen Artillery Volunteers	Innes's Self-Acting Gun-Carriage, with Elevating Mantelet	XIX. 82	1875
J.			
JAMES, Wm., late 42nd Highlanders	A Method of Converting the Regulation Bell Tent into a Shelter Tent, with a New Arrangement for Entrenching Tools	XVI. 67	1872
JAMES, W. H., Lieut. R.E., F.G.S.	Notes on Field Guns .. ..	XX. 87	1876
JEKYLL, Herbert, Lieut. R.E.	The Destruction of Wrecks under Water	XIII. 55	1869
JENSEN, Peter	Steenstrup's Conical Screw and Breech-Loading Cannon	XIV. 57	1870
JERVOIS, W. Drummond, C.B., Col. R.E., Deputy Director of Works for Fortifications	Coast Defences, and the Application of Iron to Fortifications	XII. 52	1868
JONES, Alfred S., U.C., Major, Adj. Staff College, Sandhurst	The Education of Staff Officers .. ..	XIV. 59	1870
JONES, Lieut.-Col., U.C., Adjutant Staff College, Sandhurst	Ride and Tie Patrolling, and Section-Skirmishing	XVI. 66	1872
JONES, E. M., Major 20th Regiment	The Latest Changes made by the Prussians in their Infantry Drill Book	XVI. 68	1872
K.			
KNOLLYS, W. W., Major 93rd Highl., Garrison Instructor, Home District	Disembarkations (Lecture to Officers of Volunteers)	Special No.	1873

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
<b>L.</b>			
LACON, W. Stirling.	The Rule of the Road at Sea, or the Steering and Sailing Rules	XVI. 67	1872
„ „	Lowering Boats at Sea .. ..	XVII. 71	1873
LAMPREY, J., M.B., F.R.G.S., Surgeon 67th Regiment	The Economy of the Chinese Army ..	XI. 46	1867
LATHAM, John, F.S.A.	The Progress of Breech-Loading Small Arms	XIX. 83	1875
LAUDERDALE, Adml. the Earl of, G.C.B.	The Best Mode of Defence of the Protected Territories on the Gold Coast of Africa, and the Organization of a Force Sufficient for that Purpose	XVII. 74	1873
LAUGHTON, J. K., M.A., R.N., Mathe- matical and Naval Instructor, Royal Naval College, Greenwich	Ocean Currents .. ..	XV. 65	1871
„ „	The Scientific Study of Naval History ..	XVIII. 79	1874
„ „	Scientific Instruction in the Navy ..	XIX. 81	1875
LEAHY, Arthur, Major R.E.	Army Organization : our Infantry Forces and Infantry Reserves	XII. 50	1868
LEAHY, Arthur, Lieut.-Col. R.E.	The Organization of our Military Forces	XV. 63	1871
„ „	Military Bridge Construction .. ..	XIX. 84	1875
LINDSAY, Charles, Lieut. R.N.	Plan for Protecting Ships (at anchor) Blockading a Port from Attacks by Outrigger, Whitehead, or Harvey Torpedoes	XIX. 82	1875
LIVESAY, R. A. E., Capt. R.E.	The New French Rifle .. ..	XX. 86	1876
LOYD LINDSAY, R. J., V.C., Lieut.- Colonel, M.P.	Aid to the Sick and Wounded in War ..	XV. 64	1871



NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
LOHLEIN, Ludwig, late Captain 1st Baden Body Guard Grenadier Regt.	Campaign of 1870-71, &c.—(Notice of book)	XX. 88	1876
LONGMORE, T., C.B., M.D., Dep. I. G. Hospitals	The Geneva Convention of 1864, in Relation to Aid afforded by Volunteer Societies to Sick and Wounded Soldiers during the late Franco- Prussian War, &c.	XVI. 67	1872
LORD, W. B. (h.p.), R.A.	Description of a New Filter .. ..	XII. 51	1868
LUARD, C. E., Capt. R.E.	Field Railways and their General Appli- cation in War	XVII. 74	1873
LUMLEY, Henry, Assoc. I.N.A.	Lumley's Patent Rudder .. ..	XIV. 57	1870
M.		XVIII. 76	1874
MACDONALD, J. D., M.D., F.R.S., R.N., Staff-Surgeon (Pro- fessor of Naval Hygiene, Army Medical School, Netley)	Ventilation of Ships, especially of Low Freeboard and Hospital Ships		
MACKAY, James ..	The Mackay Gun and Projectiles ..	XII. 50	1868
MACKIE, Samuel J., Assoc. Inst. C.E.	The National Defences of Great Britain, Especially with Reference to the Future Requirement of Floating Forts	XII. 49	1868
„ „	Summary of the Experiments at Shoe- buryness during the year 1868-69	XIII. 55	1869
MACLEAN, W. C., M.D., C.B., Sur- geon-General (Pro- fessor of Military Medicine, Army Medical School, Netley)	Sanitary Precautions to be Observed in the Moving and Camping of Troops in Tropical Regions, &c.	XVIII. 76	1874
MACOMBER, D. O., C.E.	The Macomber Gun .. ..	XIX. 81	1875
MAGREGOR, John, M.A.	On Training Boys for Soldiers .. ..	XIX. 82	1875

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
MAITLAND, E., Major R.A. (Assist. Sup. Royal Gun Fac- tories, Woolwich)	Fog Signalling by Explosives .. .	XIX. 82	1875
MAJENDIE, V. D., Capt. R.A., Assist- ant Superintendent Royal Laboratory, Woolwich	Military Breech-Loading Small Arms ..	XI. 44	1867
„ „	The Martini-Henry Rifle .. ..	XIII. 55	1869
MALET, H., Lt.-Col. Gren. Guards	Our Reserve Forces .. ..	XIII. 54	1869
MARTIN, T., Lt.-Col. (late 4th K. O. R. Regiment)	Ammunition Supply Car, Skeleton Am- munition Car, Packing Ammunition, &c.	XIII. 55	1869
MARTINI and HOTZE	The Swiss Military System .. ..	XV. 64	1871
MAURICE, J. F., Lt. R.A., Professor of Tactics, R.M. Coll., Sandhurst	The Connection between the Ordinary Work of Soldiers in Peace-Time and Warlike Efficiency (Lecture to Officers of Volunteers)	Special No.	1873
MAXWELL, H. H., Colonel R.A.	The Field Gun for India.. ..	XIV. 58	1870
MIDDLETON, F. D., Lt.-Col., Superin- tending Officer of Garrison Institu- tions	The Education of the Army with Re- ference to Young Officers	XV. 65	1871
„ „	Changes of Tactics consequent on the Improvement of Weapons, &c. (Lec- ture to Officers of Volunteers)	Special No.	1873
MONCRIEFF, Alexan- der, Captain Edin- burgh Artillery Militia	Further Particulars Regarding Mon- crieff's Protected Barbette System	XI. 44	1867
„ „	The Progress that has been made in the Application of the Moncrieff System to Garrison, Siege, and Naval Ord- nance, and to Coast Works	XIV. 59	1870
MONCRIEFF, Alexan- der, Major, F.R.S.	Further Observations on the Moncrieff System of Mounting Ordnance	XVII. 74	1873
„ „	On Harbour Defence .. ..	XIX. 81	1875

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
MOORE, Arthur, Lieut. R.N.	Proposed Plan of Canvas Pontoons to be made out of Ships' Stores	XIX. 84	1875
MOORE, Sandford, Surgeon, M.B., F.S.S. (Instructor, Army Hospital Corps)	Assistance to the Wounded in Time of War	XX. 88	1876
MORGAN, J. P., Capt. R.A.	A Proposal for a very Heavy Breech- Loading Gun of Novel Construction	XIV. 60	1870
" "	The Determination of the Explosive Force of Gunpowder	XV. 64	1871
" "	Rifling for Heavy Guns .. ..	XVII. 74	1873
MORGAN, J. P., Major R.A. (Assist. Super. Royal Gunpowder Factory, Waltham Abbey)	Recent Improvements in the Manufac- ture of Pebble Powder	XVIII. 77	1874
" "	Breech-Loading and Muzzle-Loading for Guns	XVIII. 78	1874
" "	Some Special Features in Large and Small Grain Powders	XX. 86	1876
MORIARTY, H. A., C.B., Staff-Com- mander R.N.	The Atlantic Telegraph Cables of 1857- 58, also those of 1865-66	XI. 44	1867
MOUAT, F. J., Sur- geon-Major, M.D., F.R.C.S.	A Visit to Some of the Battle Fields and Ambulances of the North of France	XV. 64	1871
MURRAY, Andrew, C.B.	The Turbine Propeller .. ..	XV. 65	1871
<b>N.</b>			
NAPIER, the late Sir Chas. J., G.C.B., Lt.-Gen.	Note on the Battle of Thrasyment ..	XVIII. 78	1874
NEWDIGATE, E., Col.	Prussian Drill, 1876 .. ..	XX. 88	1876
NICOLSON, Sir Fredk. • W. E., Bart., C.B., Vice-Admiral	A Few Notes on Captain Dyer's Paper.— (See DYER)	XVIII. 77	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
NOAKE, R. C., Capt. and Adj. Scottish Borderers Militia	The Best Mode of Recruiting for the Army, and the Influences bearing upon that Service	XI. 43	1867
NOEL, Gerard H. U., Comr. R.N.	The Best Types of War Vessels for the British Navy.—(The Naval Prize Essay, 1876)	XX. 86	1876
NOLAN, John Philip, Capt. R.A.	Ranges and Nolan's Range Finder ..	XIV. 57	1870
<b>O.</b>			
O'HEA, J. B., Capt. late 25th Regt.	Cartridges for Breech-Loading Small Arms, and the Best Form of Projectile	XII. 48	1868
„ „	Rifles and Rifling .. .. .	XVII. 72	1873
ORDE-BROWNE, C., Capt. late R.A.	Firing at Armour Clads reduced to a System	XVI. 69	1872
OUVRY, H. A., Col. C.B.	A Review of the Improvements in Military Tactics and Formation in Germany during the last year (1873), being a précis of an Article from the “ Militaire Wochenblatt ”	XVIII. 78	1874
OWEN, C. H., Lieut.- Col. R.A.	Modern Artillery, as exhibited at Paris in 1867	XII. 48	1868
<b>P.</b>			
PALLISER, William, Maj. (unattached), late 18th Hussars	The Conversion and Rifling of Cast-Iron Ordnance and on Chilled White Iron Projectiles	XI. 44	1867
„ „	The Construction of Heavy Rifled Ord- nance	XII. 50	1868
PARKER-RHODES, C. E.	Parker-Rhodes's Military Boot .. ..	XVI. 69	1872
PARKER, F. G. S., Capt. 54th Regt.	Proposed Method of Attack in Skirmish- ing Line	XVII. 74	1873
PARKYNS, Mansfield	Abyssinia .. .. .	XII. 51	1868
PAYNTER, J. Aylmer, Rear-Admiral	A New Adaptation of Screw Propulsion	XVIII. 79	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
PELLEW, Pownoll W., Commander R.N.	Fleet Manœuvring .. .. .	XI. 47	1870
PHELPS, Charles ..	Description of Mont Storm's Breech- Loading 9-pounder Field or Pinnacle Gun	XIV. 5	1867
PICK, Dr. E. ..	A New Method of Improving the Memory and Facilitating the Acquire- ment of Knowledge	XI. 43	1867
POLE, Professor W., F.R.S., M.I.C.E.	The Modes of Determining the Accuracy of Artillery	XI. 43	1867
POORE, F. H., Capt. R.M.A.	Target for Eye-Training .. .. .	XVII. 72	1873
PRATT, S. C., Lieut. R.A.	The Constitution and Duties of the Artillery of the Advanced Guard of an Army in the Field—(The R. A. Institution Prize Essay of 1874)	XVIII. 79	1874
PRIDEAUX, T. Symes, C.E.	Economy of Fuel in Ships of War ..	XVI. 68	1872
PRITCHARD, H. Baden, Chemical Depart- ment, Roy. Arsenal, Woolwich	The Application of Photography to Military Purposes	XIII. 55	1869
Q.			
QUICK, Geo., Engineer R.N.	Proposed New Combination of Pro- pellers for Ships of War	XX. 86	1876
R.			
RAIKES, G. A., Capt. 3rd W. Y. L. I. Militia	Historical Records of the First Regiment of Militia or 3rd W. Y. L. Infantry— (Notice of Book)	XX. 88	1876
RANKINE, Professor W. J. Macquorn, C.E., LL.D., F.R.S. &c.	The Economy of Fuel, Comprising Mineral Oils	XI. 44	1867
RAWSON, H. E., Lieut. R.E.	The German Railway Regiment. . . .	XX. 88	1876
READ, George, R.N.	Helm-Indicator for the Prevention of Collisions at Sea	XII. 48	1868
„ „	Apparatus for Light Vessels, Tidal Harbours, &c.	XII. 48	1868



NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
READ, George, R.N.	Read and Nicholl's Patent Day and Night Helm-Signals for Preventing Collisions at Sea	xvi. 69	1872
REDDIE, J., Account- ant-General's De- partment, Admi- rality	Manning the Navy .. ..	xi. 45	1867
REDMAN, J. Baldry, M.I.C.E., F.R.G.S.	The Proposed Enclosure of Dover Bay ; Review of Designs, and Historical Essay on the Harbour	xix. 83	1875
REED, E. J., C.B., M.P.	Circular Ironclads .. ..	xx. 85	1876
RENNIE, G. B., M.I.C.E.	The Comparative Merits of Simple and Compound Engines .. ..	xix. 80	1875
RICHARDS, J. C., Staff Commander R.N.	Fog Signals for Vessels under Weigh ..	xix. 82	1875
ROBERTSON, A. Cunningham, Col. Commanding 2nd Batt. 8th or King's Regt.	The Appointment and Promotion of Regimental Officers	xii. 49	1868
" "	The Constitution of our Military Forces and the Conditions of Military Service	xiii. 56	1869
ROBERTSON-ROSS, P., Colonel	Report of a Reconnaissance of the North- West Provinces and Indian Territories of the Dominion of Canada, and Narrative of a Journey Across the Continent through Canadian Territory to British Columbia and Vancouver's Island	xvii. 74	1873
ROGERS, J. B. ..	Rogers's Life-Saving Apparatus.. ..	xiv. 57	1870
ROGERS, E., Captain, F.R.G.S.	The Gatling Gun ; its Place in Tactics..	xix. 82	1875
ROSS, Major W. H., R.A.	Field Artillery on the Connected System	xii. 48	1868
" "	The Cultivation of Scientific Knowledge by Regimental Officers of the British Army	xvi. 69	1872
ROSS OF BLADENS- BERG, John, Cold- stream Guards	Maritime Rights .. ..	xx. 87	1876

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
RUSSELL, John Scott, F.R.S.	Naval Great Guns and Gunnery ..	XIX. 82	1875
RUSSELL, Frank S., Major 14th Hus.	Cavalry .. .. .	XX. 86	1876
RYDER, A. P., Rear- Admiral	Forms for Registering the Angles of Rolling and Heeling for the Infor- mation of the Construction Depart- ment of the Admiralty	XV. 62	1871
" "	The Naval Hammock, its Buoyancy and Use in Saving Life at Sea in Cases of Collision, &c.	XV. 62	1871
" "	The Higher Education of Naval Officers	XV. 65	1871
" "	Extracts from the four last Chapters of Admiral Jurien de la Gravières Work	XVII. 72	1873
RYDER, A. P., Vice- Admiral	H. M. S. "Victor Emanuel" as an Hospital Ship during the late Ashantee Campaign	XVIII. 78	1874
" "	A Statement to Accompany the Russian Ramming Diagrams Presented by him to the Institution	XVIII. 79	1874
<b>S.</b>			
SCHAW, H., Capt. R.E., Professor of Fortification and Artillery, Staff College, Sandhurst	The Amount of Advantage which the New Arms of Precision give to the Defence over the Attack	XIV. 59	1870
SCHAW, H., Lieut.- Col. R.E., &c. &c.	Field Engineering, Illustrated by some of the Operations of the German Engi- neers during the War of 1870-71	XVIII. 76	1874
SCHNACKENBURG, Captain	Leitfaden für den Unterricht in der Dienstkenntniss auf den Königlichen Kriegsschulen—(Notice of book)	XX. 88	1876
SCHOMBERG, G. R., Major - General, C.B., R.M.A.	Are the Royal Marines a Necessary Auxiliary to the Royal Navy?	XV. 64	1871
SCOTT, Robert H., Director of the Me- teorological Office	Storms in the British Islands, and Tele- graphic Weather Intelligence	XIII. 54	1869

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
SCOTT, R. A. E., Capt. R.N.	The Maritime Defence of England, including Offensive and Defensive Warfare:—Part I. The Organization of our Maritime Forces. Part II. Our Ships of War, their Armament, &c.	XX. 87	1876
SECCOMBE, E. (Admiralty)	The Preservation of Biscuit and other Farinaceous Articles of Diet in H.M. Navy from Weevil, Maggots, and other Insects	XIX. 83	1875
SELWYN, Captain J. H., R.N.	Breech - Loaders, with Reference to Calibre, Supply, and Cost of Ammunition	XI. 43	1867
„ „	Further Information on the Employment of Mineral Oils as Fuel for Steam Ships	XII. 48	1868
„ „	The True Economies of England's Naval Power	XV. 63	1871
SHARPE, Benjamin, Commander (ret.) R.N.	The Revolving System of Firing Great Guns	XIII. 56	1869
SHORTLAND, P. F., LL.D., Capt. R.N.	Economy of Coal as Viewed by the Commander of a Steam Vessel	XVIII. 76	1874
SHUTE, C. Cameron, Colonel, C.B.	Military Maxims Suggested or Exemplified by the last Autumn Manœuvres of Continental Armies	XIV. 58	1870
„ „	A Memorandum on Mitrailleurs. . .	XVI. 66	1872
SIMPSON, C. H., Capt. R.N.	Plan of Sustaining and Lowering Ship's Quarter Boats	XI. 47	1867
„ „	A New Mode of Marine Propulsion . .	XI. 47	1867
SKINNER, Major- General, C.B.	A Cylindrical Propeller Working on a Vertical Shaft in the Midship Section of a Ship	XIV. 58	1870
SLOANE, Captain, Sherwood Foresters Militia	Utilization of the Soldiers' Unemployed Time: A Proposed Scheme Independent of Government Supply; also a Plan for Regimental Charities	XII. 48	1868
SMITH, Michael W., Major-Genl. C.B.	Cavalry: How far its Employment is Affected by Recent Improvements in Arms of Precision	XII. 49	1868
SMITH, Henry . .	Life-Saving Bed or Mattress . . . .	XIII. 54	1869

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
SMITH, R. Murdoch, Captain R.E., F.R.G.S., &c.	The Strategy of Russia in Central Asia, from a Persian Point of View	XVII. 71	1873
SOADY, F. J., Lieut.- Colonel R.A.	Observation on the Defence of England	XIV. 61	1870
SÖRENSEN, John ..	Sörensen's Norwegian Self-Acting Cook- ing Apparatus	XII. 49	1868
STONE, C. P., Lieut. 77th Regiment	Elevating Gun Platform .. ..	XIII. 53	1869
STONE, F. S., Capt. R.A., Assist. Super- intendent Royal Gun Factories, Woolwich	The Progress of our Heavy Ordnance, and the Principles and Progress of its Construction	XIV. 58	1870
STOTHERD, R. H., Capt. R.E., In- structor in Tele- graphy, School of Military Engineer- ing, Chatham	Military Telegraphy and Signalling ..	XIV. 59	1870
STOTHERD, R. H., Major R.E., In- structor in Tele- graphy, School of Military Engineer- ing, Chatham	On Defensive Submarine Warfare ..	XV. 65	1871
STRANGE, T. B., Capt. R.A.	Practical Artillery .. ..	XV. 63	1871
STRANGE, Alex., Lt.- Colonel, F.R.S.	The Necessity for a Permanent Com- mission on State Scientific Questions	XV. 64	1871
„ „	A Proposed Method of Mounting Heavy Ordnance at Sea on the Principle of the Bessemer Saloon	XVII. 75	1873
STUART, Graham, Capt. 4th W. Y. Artil. Volunteers	Stuart's Breech-Loading Cannon ..	XIV. 57	1870
SYMONDS, T. E., Captain R.N.	The Combined End-on and Broadside System	XI. 46	1867
SYNGE, Millington, Major-Gen. R.E.	Suggested Improvements in Sanitary Arrangements of Hospitals, Barracks, Camps, and Shipping, &c.	XVIII. 78	1874

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
<b>T.</b>			
THAYER, L. O., M.D.	Proposed Alterations in the Martini-Henry Rifle	XIX. 83	1875
THESIGER, Hon. Frederic, Col., C.B., A. D. C. to the Queen	Is a Radical Change in the Tactical Formation of our Infantry Really Necessary?	XVII. 73	1873
THOMAS, W. Cave, late Captain 19th Middlesex Rifle Volunteers	The Establishment of County Military Training Schools; a Suggestion for Improving the Recruiting System	XIII. 54	1869
TOYNBEE, H., Capt., F.R.A.S.	The Winds of the North Atlantic ..	XV. 64	1871
TOYNBEE, H., Capt., F.R.A.S. (Marine Superintendent, Meteorological Office, Board of Trade)	The Meteorology, Sea Temperature, and Currents of the 10° square of the Atlantic which lies between the Equator and 10° N., and from 20° to 30° W.	XVII. 72	1873
TOYNBEE, Mrs. ..	Delineation of some Minute Sea Surface Animals (Coloured Drawings), Part I.	XIX. 80	1875
" "	" " " " II.	XIX. 81	1875
" "	" " " " III.	XIX. 82	1875
" "	" " " " IV.	XIX. 83	1875
TRENCH, F. Chenevix, Capt. 20th Hussars, F.R.G.S.	The Central Asian Question .. ..	XVII. 71	1873
" "	The late Russian Campaign against Khiva	XVIII. 77	1874
TULLOCH, Alexander B., Captain 69th Regiment	The Protection of London against an Invading Force Landing on the East Coast	XIV. 59	1870
" "	Suggestions for a Shelter Tent .. ..	XVII. 70	1873
" "	The Education and Professional Instruction of Officers	XVII. 75	1873
TYLER, E. S., Major R.E.	The New Works for the Defence of Paris	XIX. 80	1875



NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
<b>V.</b>			
VAN MEYDEN, Aloys., Capt. d'Artillerie, Lausanne	Sur la Dispersion Naturelle des Projectiles et la Loi de Erreurs—(Notice of Book)	XX. 88	1876
VAUGHAN, J. L., C.B., Maj.-General	The Retreat of the Ten Thousand; a Military Study for all Time	XVIII. 76	1874
VINCENT, C. E. H., Lieut. 23rd Royal Welsh Fusiliers	The Austrian Confidential Report, and New Method of Promotion	XVI. 66	1872
" "	The Russian Army .. ..	XVI. 67	1872
" "	A Brief Sketch of the System of Officering the Prussian Army	XVI. 69	1872
" "	The Austrian Army .. ..	XVII. 73	1873
" "	The Armed Strength of Europe ..	XIX. 83	1875
VINCENT, C. E. H., Lieut.-Col. Central London Rifle Rangers	The Turkish Forces and the Military Aspects of the Eastern Question	XX. 86	1876
" "	The Military Resources of Holland ..	XX. 87	1876
VON SCHMIDT, Maj.- General	Instructions for the Cavalry Regiments about to take part in the Exercises of the Combined Cavalry Division detailed from Regiments. Translated by Major-General Walker—(Notice of Book)	XX. 86	1876
<b>W.</b>			
WALKER, Arthur, Captain (temp. h.p.), 79th High- landers	The Dress and Equipment of the Army	XI. 45	1867
WALKER, Beau- champ, C.B., Col., Military Attaché, Berlin	The Battle of Königgratz .. ..	XII. 51	1868
WALKER, Beauchamp Major-Gen., Military Attaché, Berlin	The Position and Lines of Defence of the 5th Corps before Versailles during the Winter of 1870-71	XV. 65	1871

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
WALKER, Beauchamp, Major-Gen., Mili- tary Attaché, Berlin	Outpost Duty .. .. .	xv. 65	1871
WARDE, Sir Edward C., K.C.B., Major- General R.A.	On the Best Practicable Method for En- suring Efficiency in the Army and for Obtaining an Effective and Reliable Reserve, having Regard to the Existing Feeling in the Country on the Subject	xix. 80	1875
WARRE, the Rev. Ed- mond, M.A. (Eton College)	Ancient Naval Tactics .. .. .	xx. 88	1876
WARREN, Frederick, Commander R.N.	Cooking for Troops .. .. .	xii. 49	1868
WAVENEY, Col. Lord, F.R.S., A.D.C. to the Queen	The Italian Army.. .. .	xx. 86	1876
WEBBER, C. E., Capt. R.E.	Military Labour .. .. .	xiv. 57	1870
WHEATLEY, John, Captain R.N.	A New Form of Ironclad Ship of War	xv. 64	1871
WHITE, Wm., F.S.A.	White's Porte-Knapsack .. .. .	xvi. 69	1872
WILBRAHAM, Sir Richard, Lieut.- General, K.C.B.	A Sketch of the Russo-Turkish Cam- paigns of 1828-29 in Europe and Asia	xx. 88	1876
WILLIAMS, W. J., Colonel R.A.	Infantry Tactics .. .. .	xvi. 69	1872
WILSON, Edmund, Captain R.N.	Description of a Model of an Armour- Plated Ship designed by him .. .. .	xii. 51	1868
„ „	Working Heavy Guns on the Broadside, with some Observations on the All- Round Fire, combined with the Broadside System of Armament	xiii. 53	1869
WILSON, C. W., Capt. R. E., Director Topographical and Statistical Depart- ment, War Office	English and Foreign Maps and their Use for Military Purposes	xvi. 67	1872
„ „	Notes on Maps (Lecture to Officers of Volunteers)	Special No.	1873
WILSON, J. C., Capt. R.N.	Seamen of the Fleet; their Training, and how the Employment of Marines Afloat in Peace Time affects them	xix. 83	1875

NAME OF AUTHOR.	SUBJECT OF LECTURE OR PAPER.	Vol. & No. of Journal.	Year.
WILSON, J. C., Capt. R.N.	Is our Merchant Service any Longer a Feeder to the Royal Navy ?	xx. 85	1876
WINGFIELD, F., Dep. Assistant Commis- sary General	Military Transport .. ..	xiii. 54	1869
WOOD, Evelyn, Col., H.C., C.B., 90th Regiment	The Ashanti Expedition of 1873 ..	xviii. 78	1874
” ”	Mounted Riflemen (Lecture to Officers of Volunteers)	Special No.	1873
WYATT, Surgeon- Major, Coldstream Guards, F.R.C.S., &c.	Personal Experiences and Reminiscences of the Siege of Paris	xvii. 71	1873

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# JOURNAL

OF THE

## Royal

## United Service Institution,

WHITEHALL YARD.

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.

Authors alone are responsible for the contents of their respective Papers.

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VOL. XXII.

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LONDON:

PUBLISHED BY W. MITCHELL AND CO.,

39, CHARING CROSS,

NEAR THE ADMIRALTY AND HORSE GUARDS,

WHITEHALL.

1879.

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# CONTENTS OF VOLUME THE TWENTY-SECOND.

	PAGE
The Naval Prize Essay, 1878—"Great Britain's Maritime Power, How Best Developed," &c. By Captain PHILIP H. COLOMB, R.N. ....	1
On some of the Main Causes which lead to the Foundering of Ships. By Vice-Admiral E. GARDINER FISHBOURNE, C.B., R.N. ....	56
On Compass Adjustment in Iron Ships, and on a new Sounding Apparatus. By Sir WILLIAM THOMSON, LL.D., F.R.S., Pres. R.S.E., &c., &c. ....	91
On Military Equipment. By Lieut. F. J. GRAVES, 20th Hussars ....	120
The Kurdistan Mountain Ranges, considered in reference to a Russian Advance on the Tigris Valley. By Lt.-Col. RALPH E. CARR, 36th Regiment. ....	155
Canada, Dominion Artillery Association. Prize Essay. By Capt. and Brevet Lieut.-Col. C. E. MONTIZAMBERT, B Battery, Canadian Artillery. ....	184
The Telephone and its application to Military and Naval Purposes. By W. H. PREECE, M.I.C.E., &c., &c. ....	209
Names of Members who joined the Institution between the 1st January and the 31st March, 1878 ....	217
Non-commissioned Officers in Continental Armies. By JOHN ROSS-OF-BLADENSBERG, Coldstream Guards ....	221
Estimates for the Italian Navy for 1878, and an account of the new Ironclad "Italia," building at Castellamare. From the <i>Révue Maritime et Coloniale</i> ....	260
Floating of the stranded French man-of-war "Escopette." From the <i>Moniteur de la Flotte</i> ....	262
The Russian Establishment at Vladivostock. From the <i>Rivista Marittima</i> . . .	263
Notices of Books ....	265
On the Laws and Customs of War as limiting the Use of Fire-Ships, Explosion Vessels, Torpedoes, and Submarine Mines. By Admiral the Right Hon. Lord DUNSANY ....	271
On Some of the True Bases for a Rule of the Road at Sea. By Captain P. H. COLOMB, R.N. ....	291
Military Notes round Plevna, and on the Danube, December, 1877-January, 1878. By Lieut. F. WELCH, 25th, King's Own Borderers. ....	328
On the Employment of the Reserve Forces in case of an Expeditionary Force being sent abroad. By Colonel H. C. FLETCHER, C.M.G., Commanding 2nd Battalion Scots Guards ....	350
Experiences of a New System of Lighting Her Majesty's Ships. By Captain CYPRIAN A. G. BRIDGE, R.N. ....	369
On the Armament and Organization of Cavalry, and their Influence on its Tactics; and Suggestions for obtaining Cavalry Reserves. By Major S. BOULDERSON, 17th Lancers. ....	378

## NAVAL ESSAYS, HONOURABLY MENTIONED.

"Organization and De-centralization." By Lieut. and Commander JAMES B. HAYE, R.N. ....	391
"Magna pericla latent." By Lieut. SYDNEY M. EARDLEY-WILSON ....	435

	PAGE
"Arma pacis fulcra." By Commander GERARD H. NOEL, R.N. (Gold Medallist, 1876) .....	461
Improvements in Lights for Signalling and other Naval and Military purposes. By A. M. SILBER, Esq. ....	499
Steam-power <i>versus</i> Sail-power for Men-of-war. By Captain P. H. COLOMB, R.N. ....	530
The best Detail Formations for Infantry Attack. By Lieut.-Colonel J. H. A. MACDONALD, Queen's, City of Edinburgh Rifle Volunteer Brigade .....	556
The Population, Prospects, and Future Government of the Transvaal. By G. PIGOT MOODIE, Esq., F.R.G.S., &c., &c. ....	583
Facts connected with the Naval Operations during the Civil War in the United States. By Rear-Admiral R. V. HAMILTON, C.B., &c., &c. ....	612
A Colonial Naval Volunteer Force. By THOMAS BRASSEY, Esq., M.P., &c., &c. ....	641
The Native States of India in Subsidiary Alliance with the British Government. By Colonel G. B. MALLESON, C.S.I., late Bengal Staff Corps .....	661
Communications with British India under possible Contingencies. By Major-General Sir FREDERIC J. GOLDSMID, C.B., K.C.S.I., &c., &c. ....	675
Names of Members who joined the Institution between the 1st April and the 30th June, 1878 .....	699
On the Organization and Strength of the German Navy .....	703
The Russian Navy in 1877 .....	721
The Medical Department in the Field .....	723
Russian Torpedoes on the Danube at Sulina, and at Batoum. Translated from the <i>Revue Maritime et Coloniale</i> (April, 1878) by Lieutenant J. MERYON, R.N. ....	735
"The Combat at Plevna." From the Translation, by Captain G. MACDONALD, R.E., of von Trotha's work entitled "Der Kampf um Plevna".....	745
Notices of Books, Naval and Military .....	756
Discussion on the Prize and other Naval Essays of 1878 .....	765
On the Influence of Breech-Loading Arms on Tactics, and on the Supply of Ammunition in the Field. By Colonel EDWARD CLIVE, Grenadier Guards .....	814
Discussion on the above .....	841
On the best Method of Carrying Life-Saving Apparatus on Board our Men-of-War. By Commander A. H. GILMORE, R.N. ....	864
Adjourned Discussion on the above .....	875
Names of Members who joined the Institution between the 1st July and the 30th Sept., 1878 .....	890
Musketry Instruction and Long-Range Infantry Fire in Austria, France, and Prussia. By Lieutenant WALTER H. JAMES, R.E. ....	893
Lessons from the late War. By Captain JOHN L. NEEDHAM, R.M.A., Professor of Fortification, Royal Naval College, Greenwich .....	941
On the Adoption of the Naval and Military Systems of Europe by China and Japan. By Captain CYPRIAN G. BRIDGE, R.N.....	957
Military Map-Making. By Captain T. HUNGERFORD HOLDICH, R.E. ....	977
On Afghanistan and Military Operations therein. By Lieutenant-General J. L. VAUGHAN, C.B. ....	1003
On the Strategical Conditions of our Indian North-West Frontier. By Major-General E. B. HAMLEY, C.B., R.A. ....	1027

	PAGE
Russian Torpedoes on the Danube at Soukhoun, and at Batoum ( <i>concluded</i> ). By Lieutenant J. E. MERYON, R.N. ....	1049
Military Railway-Transport in France. By Lieutenant-Colonel CLIFFORD PARSONS, Professor of Military Administration, Staff College .....	1066
Repeating Rifles: a short Account of those in Use in France, Norway, Austria, and Switzerland. By Lieutenant WALTER H. JAMES, R.E. ....	1090
Notices of Books .....	1102

Proceedings of the Forty-eighth Anniversary Meeting .....	i
Statement of Changes amongst the Members .....	vi
Tabular Analysis.....	vii
Award of the Referees (Military Prize Essay) and Presentation of the Gold Medal. ....	x
Names of Members who joined the Institution between the 1st October and the 31st December, 1878 .....	xv
•	
Additions to the Library :—	
Books presented .....	xvi
Books purchased.....	xviii
Parliamentary reports, &c., presented .....	xx
Journals and Transaction exchanged .....	xxii
Periodicals purchased.....	xxii
Maps, plans, charts, &c.....	xxiii
Additions to the Museum .....	xxv





# The Journal

OF THE

## Royal United Service Institution.

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VOL. XXII.

1879.

APPENDIX.

---

### PROCEEDINGS OF THE FORTY-EIGHTH ANNIVERSARY MEETING.

---

THE FORTY-EIGHTH ANNIVERSARY MEETING of the Members was held in the Theatre of the Institution, on Saturday, March 1st, 1879.

FIELD-MARSHAL HIS ROYAL HIGHNESS THE DUKE OF CAMBRIDGE, K.G., &c., &c., &c., COMMANDING-IN-CHIEF, PRESIDENT OF THE INSTITUTION, IN THE CHAIR.

The CHAIRMAN:—Gentlemen, before we begin the business of the day, I will just explain how it is that I have taken the Chair on this occasion. It was to have been taken by the Secretary of State for War, but there being a Cabinet Council at 12 o'clock, it was impossible for him to attend, and he asked me—if it would not be inconvenient to me—if I would take his place. I could not hesitate for a moment to undertake the duty, and this will explain the reason why you see me in the Chair in his stead.

I. The Secretary read the notice convening the Meeting.

II. The Secretary read the Minutes of the Forty-seventh Anniversary Meeting.

III. The Forty-eighth Annual Report was read as follows:—

1. The Council have the pleasure of laying before the Members their Forty-Eighth Annual Report.

#### MEMBERS.

2. Forty-one Life Members and One hundred and ninety Annual Subscribers, making a total of Two hundred and thirty-one new Members, joined the Institution during the past year. The loss by death amounted to Ninety-one, and Fifty-five Members withdrew their names, whilst the names of Five have been struck off the list in consequence of the non-payment of their subscriptions for many years, after frequent applications. The increase therefore is Eighty.

A detailed statement of the changes in the List of Members, and a tabular analysis of the present and past state of the Institution, will be found on pages vi and vii.

#### FINANCE.

3. The usual Abstract of the Yearly Accounts, as audited on the 6th February, will be found on the following page.

GENERAL ABSTRACT OF THE ACCOUNTS OF THE ROYAL UNITED SERVICE INSTITUTION,  
FROM 1<sup>st</sup> JANUARY to 31<sup>st</sup> DECEMBER, 1878.

EXPENDITURE.		£	s.	d.	RECEIPTS.		£	s.	d.
Secretary's Salary	...	350	-	-	Annual Subscriptions, at 10s.	...	237	-	7
Ditto Lodging Allowance	...	50	-	-	" " above 10s.	...	2,587	14	7
Librarian's Salary	...	...	...	...	" " arrears	...	40	3	-
Clerk's Salary	...	...	...	...	" " advance	...	14	-	-
Servants' Wages	...	...	...	...	Increased Subscriptions, at 10s.	...	3	-	-
Ditto Clothing	...	...	...	...	Entrance Fees	...	2,881	17	7
Insurance	...	...	...	...	Donations	...	231	2	-
Fuel	...	...	...	...	Dividends	...	...	1	1
Lighting	...	...	...	...	Interest on Exchequer Bills	...	...	388	2
Assessed and Income Taxes	...	...	...	...	Government Grant	...	...	6	5
Parish and Water Rates	...	...	...	...	Sale of Journals	...	...	600	-
Artificers	...	...	...	...	Miscellaneous Receipts	...	...	153	-
Museum	...	...	...	...		...	...	3	4
Gold Medal	...	...	...	...		...	...	...	...
Library, Reading, and Topographical Rooms	...	...	...	...		...	...	...	...
Advertisements	...	...	...	...		...	...	...	...
Printing Circulars and Stationery	...	...	...	...		...	...	...	...
Lectures	...	...	...	...		...	...	...	...
Journals, including Annual Report and List of Members	...	23	1	-		...	...	...	...
Postage { Letters	...	231	9	6		...	...	...	...
Postage { Journals	...	...	...	...		...	...	...	...
House Expenses and Sundries	...	...	...	...		...	...	...	...
Cash repaid to Agents	...	...	...	...		...	...	...	...
Charges from ditto	...	...	...	...		...	...	...	...
For £366 6s. 3d. 3 per cent. Consols	...	...	...	...	Balance at Bankers, 31st December, 1877	...	...	...	120
Balance at Bankers	...	...	...	...	Life Subscriptions	...	...	...	459
	...	...	...	...		...	...	...	-
Total Income and Life	...	...	...	...	Total Income and Life	...	...	...	£4,843 16 3

Examined and found correct—  
6th February, 1879.

J. E. A. DOUGLASS,  
Tob. G. RIDGWAY,  
Edw. DRAPEL.

Auditors.

T. D. SULLIVAN, Accountant.

T. D. SULLIVAN, Accountant.

# ESTIMATE OF RECEIPTS AND EXPENDITURE FOR THE YEAR 1879.

EXPENDITURE.			RECEIPTS.		
	£	s. d.		£	s. d.
Secretary's Salary and Lodg- ing allowance .. ..	400	- -	Balance at Bankers, 31st Dec., 1878 .. ..	55	- -
Librarian and Accountant's do.	240	- -	Annual Subscriptions :		
Clerk's do. .. ..	130	- -	£   s.   d.		
Servants' Wages .. ..	550	- -	At 10s. ..	230	- -
Ditto Clothing .. ..	65	- -	Above 10s.	2,670	- -
Insurance .. ..	18	- -		2,900	- -
Ground Rent .. ..	205	- -	Entrance Fees .. ..	230	- -
Fuel .. ..	55	- -	Dividends .. ..	400	- -
Lighting .. ..	60	- -	Interest on Exchequer Bills .. ..	15	- -
Assessed and Income Taxes	65	- -	Government Grant ..	600	- -
Parish and Water Rates	100	- -	Sale of Journals .. ..	135	- -
Artificers, Repairs, &c. ..	250	- -			
Museum .. ..	100	- -			
Gold Medal .. ..	12	- -			
Library and Topographical Departments .. ..	200	- -			
Advertisements .. ..	100	- -			
Printing Circulars, & Sta- tionery .. ..	200	- -			
Lectures .. ..	50	- -			
Journals, including Print- ing Annual Report and List of Members ..	1,300	- -			
Postage of Journals .. ..	200	- -			
Postage .. ..	30	- -			
House Expenses and Sun- dries .. ..	60	- -			
Balance .. ..	45	- -			
Total.. ..	£4,335	- -	Total.. ..	£4,335	- -

## LIFE SUBSCRIPTIONS AND CAPITAL ACCOUNT.

4. Life Subscriptions to the amount of £363 6s. 3d., including £140 10s. not invested in 1877, have been invested in Three per Cent. Consols, thus raising the funded property of the Institution on the 1st January, 1879, to £12,091 6s. 10d.

## THE FUTURE LOCALITY OF THE INSTITUTION.

5. The Council regret that they are still unable to give the Members any information on this subject. They do not, however, anticipate that any change will take place during the present year.

# LECTURES AND JOURNAL.

6. During the past year, twenty-four lectures were delivered, and thirteen papers were read in the Theatre of the Institution. The Council record their best thanks to those gentlemen who afforded so much valuable professional information.

The Garrison Instructor of the Home District also delivered six lectures on "Out Post" and other duties, in the Theatre of the Institution to the Officers of the Auxiliary Forces of his District; these lectures were very fully attended.

The high character of the Journal has been maintained, and it has had a large circulation both at home and abroad, the sale having been the highest recorded in any year except 1873.

An Index to Vols. XI—XX inclusive has been recently issued.

## LIBRARY.

7. Four hundred and fifty volumes were added to the Library during the past year; of these, two hundred and fifty were purchased and the remainder presented. Among the latter, the following are the most noteworthy:—

By the AUSTRIAN Government—

*Mittheilungen über Gegenstände des Artillerie- und Genie-Wesens.*  
*Mittheilungen aus dem Gebiete des See-wesens.*  
*Organ des Wiener Militär-wissenschaftlichen Vereins.*

By the FRENCH Government—

*Revue Maritime et Coloniale.*  
*„ Militaire de l'Étranger.*

By the GERMAN Government—

*Archiv für die Artillerie- und Ingenieur-Offiziere des Deutschen Reichsheeres.*  
*Jahrbücher für die Deutsche Armee und Marine.*  
*Militär-Literatur-Zeitung.*  
*Neue Militärische Blätter.*

By the NETHERLANDS Government—

*Plates of "Matériel de l'Artillerie."*

By the RUSSIAN Government—

*Engineering Journal.*  
*Naval Review.*

By the SWEDISH Government—

*Krigs-Vetens-Kaps Akademiens Handlingar.*

By the UNITED STATES Government—

*Twenty-two Volumes*, including the Reports of the Secretary of the Navy, the Chief of Ordnance, and the Chief of Engineers, with sundry Maps and Charts.

The exchange of Journals with Foreign Governments, and with several Scientific Societies in this and other Countries, has been continued.

The Library now contains 18,750 volumes.

The Institution is indebted to the Lords Commissioners of the Admiralty, and to the Secretaries of State for War and for India, who have presented various works issued by their departments.

### MUSEUM.

8. By the arrangement contemplated in last year's report, additional space has been obtained in the Gun-Model Room, and some Models of Gun Carriages have been purchased. A list of the additions to the Museum, and to the Library will be found in the Proceedings of this day's Meeting, and in the Appendix to Vol. XXII of the Journal.

### VICE-PATRON.

9. The Council have had the pleasure of electing the Right Honourable Lord Hampton, G.C.B., a Vice-Patron of the Institution.

### VICE-PRESIDENTS.

10. The Council regret to record the death of one of the Vice-Presidents of the Institution, Admiral Sir George Back, D.C.L., F.R.S., &c., &c.

Sir George Back became a Member of the Institution in 1833, was elected a Member of Council in 1845, and a Vice-President in the same year.

The Council have elected as a Vice-President of the Institution Lieut.-General Stephenson, C.B., who has for several years filled the offices of Chairman and Vice-Chairman of Council.

### HONORARY MEMBERS.

11. The Council have admitted several Officers of Foreign Armies as Honorary Members during their stay in this country.



## CORRESPONDING MEMBERS OF COUNCIL.

12. On the 1st January, 1879, there were 309 Corresponding Members of Council.

Whilst thanking the Corresponding Members for their past services, the Council earnestly invite them to renewed exertions towards obtaining for the Institution a more extended support from the Officers of H.M.'s Services.

## GOLD MEDAL.

13. Twelve Essays were received in competition for the Gold Medal, the subject being "Field Intrenching; its Application on the Battle-Field, and its Bearing on Tactics." Lieut.-General Sir Henry Lefroy, K.C.M.G., R.A.; Colonel Sir Lumley Graham, Bart.; and Colonel H. Schaw, R.E., kindly undertook the duties of Referees. Their award will be made known to this Meeting.

The subject for the Naval Essay for this year is—

"Naval Tactics on the open sea, with the existing types of vessels and weapons."

The competition is now thrown open to all persons eligible to become Members of the Institution.

## CONCLUSION.

In conclusion, the Council point with satisfaction to the increase in the number of Members, to the sound condition of the finances, and to the high estimation in which the Institution is held, both at home and abroad.

STATEMENT OF CHANGES AMONG THE MEMBERS SINCE  
1ST JANUARY, 1878.

	Life.	Annual.	Total.
Number of Members, 31st December, 1877 ..	1,177	3,228	4,405
„ „ joined during 1878 ..	41	190	231
	1,218	3,418	4,636
Changed from Annual to Life	+10	-10	
	1,228	3,408	4,636
	Life.	Annual.	
Deduct—Deaths during 1878 ..	28	63	
Withdrawals..	—	55	
Struck off ..	—	5	
	28	123	
	28	123	151
Number of Members on 1st January, 1879	1,200	3,285	4,485

# TABULAR ANALYSIS OF THE STATE OF THE INSTITUTION

To 31st of December, 1878.

Year. 1st Jan. to 31st Dec.	Annual Subs. received.	En- trance Fees.	Income (from all sources).	Life Subs. received.	Amount of Stock.	Invested in the purchase of Books, &c.	No. of Vols. in Library.	No. of Mem- bers on the 31st Dec.	Number of Visitors
£	£	£	£	£	£	£			
1831	654	..	654	1,194	..	..	..	1,437	..
1832	1,146	..	1,146	973	..	..	..	2,699	..
1833	1,405	..	1,450	692	..	..	..	3,341	..
1834	1,500	..	1,549	583	1,100	..	..	3,748	13,376
1835	1,480	..	1,574	366	2,430	40	..	4,155	8,537
1836	1,570	..	1,682	330	3,747	45	..	4,069	8,521
1837	1,549	..	1,747	222	4,747	180	..	4,164	10,907
1838	1,462	..	1,634	230	5,500	246	..	4,175	15,788
1839	1,399	..	1,565	168	5,500	292	..	4,186	16,248
1840	1,363	..	1,525	198	5,500	446	5,500	4,257	17,120
1841	1,450	..	1,643	186	6,000	243	5,850	4,243	19,421
1842	1,373	..	1,565	144	6,400	373	6,450	4,127	21,552
1843	1,299	..	1,494	140	6,700	237	7,000	4,078	27,056
1844	1,274	..	1,408	112	3,000	298	7,850	3,968	22,767
1845	1,313	..	1,466	228	1,500	127	8,100	3,988	21,627
1846	1,298	..	1,456	138	1,500	74	8,410	4,031	32,835
1847	1,314	74	1,502	132	1,700	37	..	4,017	38,699
1848	1,175	57	1,375	48	1,700	85	9,641	3,947	37,140
1849	1,176	72	1,375	84	1,150	58	..	3,970	33,333
1850	1,141	106	1,294	198	600	36	..	3,998	33,773
1851	1,136	131	1,292	66	666	34	10,150	3,188	52,173
1852	1,134	133	1,281	114	200	43	10,300	3,078	20,609
1853	1,243	319	1,684	264	528	41	10,420	3,251	25,952
1854	1,200	138	1,368	126	612	95	10,587	3,171	22,661
1855	1,159	107	1,289	120	653	55	10,780	3,131	14,778
1856	1,216	197	1,519	156	761	47	10,832	3,204	16,184
1857	1,258	176	1,937	78	1,038	40	10,960	3,168	12,755
1858	1,318	221	2,102	105	438	31	11,062	3,246	25,747
1859	1,526	195	2,277	512	946	70	11,320	3,344	28,739
1860	1,961	298	3,577	397	2,178	114	11,517	3,518	28,011
1861	2,122	305	2,899	266	2,846	99	11,812	3,689	23,296
1862	2,296	242	3,127	239	3,178	109	12,026	3,797	27,215
1863	2,379	218	3,100	405	3,583	143	12,296	3,847	18,150
1864	2,425	215	3,253	222	4,516	116	12,700	3,902	17,276
1865	2,435	154	3,467	235	4,804	137	13,000	3,895	18,253
1866	2,435	157	3,488	299	5,486	150	13,337	3,891	17,067
1867	2,431	141	3,467	208	5,732	140	13,800	3,823	17,211
1868	2,446	184	3,534	297	6,396	119	14,100	3,812	16,417
1869	2,368	165	3,485	238	6,653	232	14,660	3,792	15,947
1870	2,376	178	3,493	333	7,313	140	15,055	3,831	18,654
1871	2,455	237	3,677	538	7,748	202	15,501	3,922	19,420
1872	2,620	336	4,111	713	8,927	192	15,761	4,116	19,773
1873	2,776	295	4,316	535	9,465	222	16,227	4,276	18,183
1874	2,819	216	4,491	409	10,189	218	16,624	4,330	16,771
1875	2,801	154	4,595*	469	10,721	228	17,000	4,308	15,960
1876	2,794	162	4,500	437	11,305	171	17,700	4,320	15,543
1877	2,840	218	4,750	526	11,725	217	18,300	4,405	15,682
1878	2,881	231	4,700	459	12,091	231	18,750	4,485	17,881

\* A legacy of £100 was received this year.

## IV. General Sir LINTORN SIMMONS, K.C.B., R.E.—

Your Royal Highness and Gentlemen,—I have great pleasure in moving the adoption of the Report, and I will occupy your time but a very few minutes in making such observations as have occurred to me on its perusal. First, I would observe that it appears that the Institution is progressing favorably, though gradually. It is rather remarkable, as regards the number of Members, that in 1840 they were nearly as numerous as they are now. The numbers fell in 1852, just before the Crimean War, to a minimum of 3,000, but for the last seven or eight years there has been a steady and gradual increase. This is satisfactory, but the increase is not to the extent which the Institution has a right to expect; this is probably due to the advantages which it affords to Members not been thoroughly understood and appreciated by those who have not the honor of being Members of the Institution. On looking through the accounts, I see the large sum of £1,700 was expended last year on the Journal of the Institution and in distributing it to its Members. Of this sum, £230 were expended in postage. Now, Gentlemen, I think it is a very liberal proceeding on the part of the Council of this Institution to distribute their Journal—which is every year becoming more and more valuable—free of all cost to its Members, not only in England but throughout the world. This is done at a large cost, and I can hardly imagine that it is generally known to persons who are not Members that this is one of the advantages of the Institution. And when it is considered that the Journal contains Papers and Lectures that have been given in this room by such distinguished Gentlemen as those who took the trouble, at the request of the Council, to lecture during the past year, I am much surprised that this Journal has not a more extended circulation. Amongst these names were, Admirals Fishbourne, Lord Dunsany and Hamilton, Generals Hamley and Sir Frederick Goldsmid, and Colonels Clive, of the Guards, and Malleon; we also had the advantage of a lecture from Mr. Brassey, Lieut.-Commandant of the Naval Artillery Volunteers, and lately from Captain Templer, of the Militia, on the subject of ballooning. We have, besides, had the advantage of listening to one of the members of the Manufacturing Departments of the Arsenal. When these lectures are considered, and the discussions which have taken place upon them, the Journal becomes a really valuable document, and the small subscription to the Institution of £1 a year is, in my humble opinion, amply repaid by the liberality of the Council in circulating this Journal. I would next observe, that there is one point which has been alluded to in the Report, from which it appears that the Institution is in some little uncertainty as to its future, and that is the position in which we stand as regards a house. We are still only quarterly tenants of this building, and, therefore, liable to be turned out at short notice. I believe there has been some sort of undertaking on the part of the Government not to be hard upon us, but, it is very desirable, if we could, that we should get a permanent location in this metropolis. In mentioning the lectures, I forgot to refer to a peculiar feature in the last year, which was that this lecture room was lent by the Council for the benefit of instruction to Officers of the Auxiliary Forces in London, and that half a dozen lectures were given in this room by the Instructor of the Home District, which were well attended by Officers of the Auxiliary Forces. I do not know that there is any other particular point to which I need draw your attention, but, on the whole, I think the Members have every reason to congratulate the Council on the success of their proceedings during the last year, and I therefore have much pleasure in moving “That the Report now read be adopted and printed for circulation among the Members.”

## Admiral Sir COOPER KEY, K.C.B. :—

I beg to second the Resolution proposed by Sir Lintorn Simmons, that the Report be adopted and circulated. The Report itself is very concise, and requires no assistance from me to induce you to accept it, neither does it need any additional argument to prove that the Institution is progressing in a very satisfactory



manner. I thoroughly concur in the remarks that have fallen from Sir Lintorn Simmons as to the great value of the Journal, and I am surprised that more Officers, both of the Army and Navy, do not avail themselves of the privileges afforded to Members by this Institution, of obtaining the Journal at so small a cost. The number certainly increases but slowly. I can testify, from my own experience, to the great interest taken in the Journal by Officers on the North American and West Indian Stations. Whenever it came out, it was eagerly sought for, and we who received it, endeavoured to persuade those who were anxious to read it that they ought to become subscribers; and, no doubt, some did join the Institution for that reason. As I have said, it was eagerly sought after and read, for I may say that this Institution stands alone in laying before the Officers of the Army and Navy, scientific instruction in the art of war. I do not mean that you do much scientific work in its highest sense, but a large amount of practical science which is of so much value to Officers of both Services. I thoroughly agree with what Sir Lintorn Simmons has pointed out as to the very limited accommodation we have here. We constantly see this Theatre overcrowded with people wishing to hear the interesting lectures here delivered; and the Museum is also so full that there is no space to arrange the collection properly, or to dispose of articles which are offered for our acceptance. I heard only this morning of a large model gun that an inventor wishes to present to the Institution, but we do not know where it can be placed. Then we have a very valuable Library of professional works for both Services, and for which we are similarly getting cramped for room. But of all the good works carried out by this Institution I must speak most strongly of the lectures and papers that are read in this Theatre. It is another striking instance of what we ought to be proud of in this country, the vast amount of *unpaid* work done by English people of all classes. This is a noble illustration of it, and I hope it may long continue. I beg to second the Resolution.

V. The names of the eight Members retiring from the Council by rotation were read as follows:—

Colonel H. HUME, C.B.	Colonel W. H. GOODENOUGH, R.A.
Colonel E. CLIVE.	Colonel T. D. BAKER, C.B.
General Sir RICH. WILBRAHAM, K.C.B.	Colonel LORD ELCHO, M.P.
General Sir EDWARD HODGE, K.C.B.	Rear-Admiral SELWYN.

General SCHOMBERG, C.B., R.M.A.:—

Your Royal Highness and Gentlemen,—It is not necessary that I should detain you by enlarging on the advantages of this Institution, but since entering its walls to-day, a Memo. has been placed in my hands stating that Captain Hildyard of the 71st Highlanders won the Medal of the Statistical Society for an Essay on "The Effects of Health and Disease on Military and Naval operations." Now, independently of the knowledge which he acquired in the Service, without which book-knowledge is not worth much, he worked entirely from the books in the Library. I think Officers should know of the very useful library that is at their disposal here—that whenever they have any military question on which they wish to write or speak, the book-work can be got here. I say book-work, because without practical knowledge I am quite certain books are of no use whatever. A few years ago, we Officers were accused very much of being ignorant of our profession. I do not think it was just then; there were many of us who did the best we could. Now it certainly would not be true, and there is no excuse for its being true, for the greatest pains is taken in instructing Officers, and, from my knowledge of them, I am perfectly certain, if you will take the trouble to teach them, they will learn, and do everything their country can require of them. The Resolution I have to move is, "That the thanks of this Meeting be given to the Members of the Council who retire by rotation, and that the following Members be elected to fill the vacancies":—

Colonel E. CLIVE,	} For re-election.
Colonel W. H. GOODENOUGH, R.A.,	
Rear-Admiral J. H. SELWYN,	
Colonel Sir FRANCIS W. FESTING, K.C.M.G., C.B.,	
Admiral Sir COOPER KEY, K.C.B., F.R.S.,	
Rear-Admiral R. VESEY HAMILTON, C.B.,	
Vice-Admiral Sir FRANCIS L. MCCLINTOCK, F.R.S.,	
Colonel Sir LUMLEY GRAHAM, Bart.	

for immediate election. And that the following names be adopted from which to select in case of vacancies occurring in the Council, viz. :—

Rear-Admiral E. HARDINGE, C.B.      Major-General G.W.A. HIGGINSON, C.B.

Lieutenant-Colonel HENRY B. LOCH, C.B. :—

I have great pleasure in seconding the Resolution which has just been moved, and I only wish it had been placed in the hand of one more able to attend the lectures and meetings of this Institution than I am, but I am sure, from the Report which has been read, and the remarks of the Mover and Seconder of the first Resolution, it is evident that the thanks of this Meeting are due to the Members of the Council who retire by rotation. I have the honour, therefore, to second the Resolution that has been moved.

The Resolution was put from the Chair, and was carried unanimously.

Rear-Admiral R. V. HAMILTON, C.B. :—

I rise to move the third Resolution, viz., “That the thanks of this Meeting be given to the Auditors for their valuable services, and that the following Gentlemen be elected for the ensuing year,” viz. :—

Captain J. E. A. DOLBY,—for re-election.	T. E. DRAPER, Esq.
T. G. RIDGWAY, Esq.,	E. R. RAITT, Esq.

I am sure you will all agree with me that the services which those Gentlemen have rendered are most essential to the well-being of the Institution, I therefore, beg to propose that they receive our best thanks.

The Resolution, having been seconded by Sir LUMLEY GRAHAM, was carried unanimously.

VII. The Secretary read the Report of the Referees on the Military Prize Essay, on “Field Intrenching; its Application on the Battle Field, and its Bearing on Tactics,” and the Chairman announced the name of the successful candidate to be Captain Emilius Clayton, R.A., Professor of Military History, Royal Military Academy, Woolwich.

His Royal Highness, the President, on presenting the Medal, said :—

I have great pleasure in presenting you with the Medal on this occasion. It is very highly creditable to yourself, from every point of view, and considering the great merit of the Essays generally, it is all the more creditable to the Gentleman who, in the estimation of very able men, is entitled to the prize.

Admiral Sir FREDERICK NICOLSON, Bart., C.B., Chairman of the Council :—

Your Royal Highness and Gentlemen,—I have on the part of the Council to offer an explanation of the course which they have thought it desirable to take on this special occasion. You have heard that the Referees, in the exercise of their very difficult and delicate duties, have been unable to award the Gold Medal to that



Essay which they have stated to be the one first on the list, because, unfortunately the writer of that Essay had very greatly exceeded the limit of the 48 printed pages, to which the Essays should have been confined. In these circumstances, the Council have thought it desirable to consider what course should be pursued with regard to the writer of the Essay, which, though first in order of merit, yet unfortunately cannot receive the Medal in the opinion of the Referees. A special Meeting of the Council was therefore called, and the following Resolution was adopted:—"In consideration of the high character of the Essay No. 477, 'non sine pulvere,' and the special circumstances under which the writer has failed to obtain the Gold Medal, bearing in mind the difficulty of estimating accurately the quantity of printed matter in a manuscript, as well as the fact that the Council have increased the limit from 48 to 64 printed pages for the next Prize Essay; the Council have decided to give a second Gold Medal on this occasion." I am desired by the Council to state, in the most emphatic manner, that this liberal view of theirs is not to be regarded as a precedent for the future. They feel that having extended the 48 to 64 pages of printed matter of the Journal, as announced in the Circular which was published on 1st January last, long before this question arose, they have gone to the very farthest point to which they can allow future competitors to extend their Essays, and therefore they trust that this special question will not arise again; but looking to all the circumstances of the case, I trust that the Members here present, and our Members at large, will agree that we have not done wrong in treating the matter in this liberal way. I may also state that we have received a letter from the War Office, stating that for the future the name of Officers, who are successful in obtaining our Gold Medal, will be placed in a page of the Army List. I do not doubt the Admiralty, following that good example, will do the same as regards the Naval Essays. With these few words, I will ask your Royal Highness to announce to the Meeting the name of the writer of the Essay No. 477.

The Chairman:—The Writer is Major T. Fraser, R.E.

The Secretary then read the names of the writers of the four Essays, honourably mentioned, viz., Lieut. Reginald Porter, R.E.; Major-General Cunningham Robertson, C.B.; Capt. Elsdale, R.E.; and Lt.-Col. Harrison, R.E.

Admiral the Rt. Hon. Sir JOHN HAY, Bart., C.B., M.P., &c., &c.

I rise to move the thanks of the Meeting to the three distinguished Officers, Sir Henry Lefroy, Sir Lumley Graham, and Colonel Schaw, for the trouble and attention they have bestowed on the many excellent papers which have been written by those who have competed for the Gold Medal which your Royal Highness has just bestowed on Captain Clayton. I am sorry to see that my distinguished friend, Sir Henry Lefroy, is not here to-day to receive in person the thanks which will be gladly offered to him. All who know him know what ability and painstaking labour Sir Henry Lefroy bestows on any subject submitted to him, and I feel sure his colleagues, Sir Lumley Graham (who is here), and Colonel Schaw, formed a tribunal which has given a sense of justice and security to their decision. Some disappointment may naturally be felt by the officer whose paper would have taken the Medal if its length had not transgressed our rules. I may, however, be permitted to say that condensation is a great virtue; and that in papers to be studied by Officers in the field and at sea, a short paper, bringing the whole of the merits of the case before the eye in a short space, is far more valuable than a paper fuller in its details, but not so available for rapid and immediate instruction. I quite approve, however, of the course taken by the Council, and I congratulate Major Fraser on receiving a second medal which, I am well assured, his paper has deserved. With these few remarks I desire to invite the Members present to thank Sir Henry Lefroy, Sir Lumley Graham, and Colonel Schaw, for the excellent manner in which they have discharged the laborious task allotted to them.

Lieut. General C. P. B. WALKER, C.B. :—

I have very great pleasure in seconding this Resolution. Having had a good deal of literary work to do in my day, and particularly in correcting and reading through voluminous documents, I am perfectly aware what a troublesome business it is to adjudicate on a matter of this kind ; but I think the Council could hardly, in the exercise of their discretion, have chosen three better men. Sir Henry Lefroy is a man most distinguished for his scientific attainments, and his knowledge on all scientific questions connected with Artillery. A keener and better soldier than Sir Lumley Graham we had not in the service, and Colonel Schaw's name I have only to mention, to mark his high value as an Officer of Engineers. These three having combined together, have come to a decision which must be accepted with readiness and cheerfulness by everybody ; I have, therefore, the greatest pleasure in seconding the Resolution.

Sir F. NICOLSON :—

Before Sir Lumley Graham rises to reply, it is desirable that I should read a letter which the Secretary has received from Sir Henry Lefroy. He says (having important business elsewhere), "Had I been present, I should have taken the opportunity to congratulate the Council on the marked ability of many of the competitive Essays, and the evidence they afford of the extension of professional study among the Officers, I suppose chiefly junior officers, of the Army, to which their Gold Medal is a stimulus. I should also express my entire concurrence in the decision the Council has come to with regard to an Extra Medal to the author of the Essay "Non sine Fulvere." Sir Lumley Graham intends to be present and will, no doubt, say all that is proper on the part of the Referees."

The Resolution was then put from the Chair, and was carried unanimously.

Colonel Sir LUMLEY GRAHAM, Bart. :—

I shall bear in mind what Sir John Hay has just said, that brevity is very much to be commended on all occasions ; therefore, I will trouble you with very few words. I thank Sir John Hay and General Walker, who seconded the Resolution, for the handsome terms in which they spoke of myself, and those associated with me, in the duty that the Council called upon us to perform. I, as one of the three, had the great benefit of being associated with Sir Henry Lefroy and Colonel Schaw, both highly instructed and scientific officers, and therefore my part was comparatively easy. I may say it was a work of great interest to me, reading the Essays of the gentlemen who competed ; a great many of them were very well worth reading indeed, and I may say I learned a great deal from them. I learned a great many things that I never knew before, and I was impressed very much by the great knowledge displayed, which has been gained by Officers of the Army in late years. I am sure, when I joined the Army, 32 years ago, there were not half a dozen Officers who could have written the Essays produced on this occasion. I was delighted to find that those who are now in the Service are rising to such a high pitch of scientific knowledge. I beg leave to return thanks on the part of myself and my associates, for the handsome manner in which you have acknowledged our labours.

The CHAIRMAN :—

The business of the Meeting is now concluded, but I understand it is usual that the Chairman should add a few words. Those words on my part will be very few, because really the speakers who have addressed you on the several Resolutions which have been placed before you, have said everything that could be said as

regards the present position, and the advantages of this very valuable Institution. Therefore, as far as I am concerned I have only to say, I hope it may continue to prosper as it has hitherto done, and especially that the interest taken in it throughout the two Services may greatly increase. On that point, I confess I should like to see an improvement. No doubt, it has more subscribers than it had in former years, but at the same time I cannot help thinking that it deserves more support, especially among the younger Officers of the Services, for to them an Institution of this kind must be of the greatest possible advantage. It has been already stated that the Library of this Institution is extremely valuable, containing as it does 18,000 volumes, comprising the best works on the professional questions of the two Services. There is consequently here a place of reference for young Officers who are fond of their profession, and who look scientifically at it, which they could not find anywhere else, and that alone, I should hope, would induce them to become subscribers in much larger numbers. The subscription is extremely small, it could not affect the pocket of any man, and need be no obstacle in the way of any Officer joining the Institution. Under these circumstances, I sincerely trust that the advice given by one or two speakers will be followed, and that whilst the Services take an interest in the valuable Journal, which is now largely and liberally circulated at the expense of the Institution, they may also subscribe to its funds, so that it may receive the support of those who take a real interest in the Service with which they are more immediately connected. I have explained why I am here to-day. I believe this Chair is generally occupied, either by the First Lord of the Admiralty, or by the Secretary of State for War, and, as Members of the Cabinet, those Gentlemen can say what the Government intends or does not intend to do, with reference to supporting this Institution. In spirit, I know that the Government gives it every support; of course, I cannot speak with the confidence of a Cabinet Minister, indeed, I know nothing as to what the intentions are, with regard to the place of our meeting at present. Personally, I sincerely hope we shall not be turned out. I admit that it would be very advantageous if we had a little more space, as has been alluded to by one of the speakers, for I understand that there is a big gun which cannot at present find space in our hall. That is of course a great disadvantage, but at the same time I cannot help thinking that there is a great advantage in the locality in which we are here situated, viz., that it is easy of access. I have one advantage in taking the Chair in not being a Member of the Government, and that is, that I can frankly say, that I sincerely hope that we shall remain here, and shall be allowed to continue our Meetings on this spot; but at the same time, in saying so, I speak only as an individual Member, knowing no more about it than any one of those Gentlemen whom I see around me at the present moment. As regards the value of these Essays, there can be no two opinions that the course adopted by the Council in inviting Essays upon such subjects, tends to open the intellects of the competitors, and to call attention to subjects of great professional value. I observe with no surprise that the scientific branch of the Service has carried away the palm in every direction. They naturally ought to do so, and I am glad to see they do so. It is only reasonable to expect it, and we expect to see the palm given to those Officers who are connected with the scientific branches of the Service. At the same time, I cannot help feeling that it is open to all to enter into the competition, and therefore, no one can object to the fact that the scientific branches have had the advantage, where real science and merit ought and does naturally tell in a competitive matter of this kind. As regards the conclusion, arrived at by the Council, I am delighted to hear that their view as regards a double medal, for I can call it nothing else, on this occasion has been accepted, and I believe generally approved of. I quite think that one of the merits of these papers is that they should not be too lengthy, for anything more unfortunate than very lengthy papers I cannot conceive. There is no one who has the misfortune to be compelled to wade through more public documents, of various kinds in the course of the year, than myself, and I can only say, that, if I can get a short paper and can find the pith of the matter expressed in few words, it is very much more acceptable to the reader, and I think very much more valuable in itself, than a very lengthy document, where you have to consider a great deal as to what really is the meaning of all that has been said,



I do not in the least wish to detract from the merits of the longer paper, which has received the Second Medal, but I am quite sure it is a great advantage that these papers should not be too extended; and therefore, I cannot but think that those who had to adjudge the prize were prudent, judicious and wise, in coming to the conclusion they arrived at, while, at the same time they gave full credit and advantage to the other paper which, no doubt, though I have not personally seen it, is full of merit, knowledge, and scientific information. Gentlemen, I see with pleasure that the general condition of the Institution is all that we could wish; there is no debt, there is a considerable amount of surplus, not large, but still sufficient to lead us to look forward with hope to the future. You have afforded every facility for the delivery of lectures, which become so much more essential from day to day, and if we wish in any respect to keep pace with our neighbours, with other countries, professionally, or if we wish to keep our relative position with all those Civil Institutions which abound, in this country especially, and in all countries, it is necessary that we should keep ourselves before the public, in a manner creditable to ourselves, and I believe to the Services which we represent. I hope the Institution will therefore become invigorated year by year; and if it receives the support it does from those I see now around me, and which I have often observed with pleasure, when I have come here to preside on occasions like the present, or when lectures have been given, and if, as I said before, it is taken advantage of more largely by the Junior Members of our relative professions, then I think we may look forward with the fullest confidence to the continued prosperity and usefulness of the Royal United Service Institution.

Admiral STOPFORD :—

I have very great pleasure, as an Admiral, in proposing "That the cordial thanks of this Meeting be given to Field Marshal His Royal Highness the Duke of Cambridge for his kindness in taking the Chair on the present occasion."

General STEPHENSON, C.B. :—

I have great pleasure in seconding the Resolution. It is hardly necessary for me to refer to the great interest his Royal Highness has invariably shown in the proceedings of this Institution, but, if any such proof were necessary, I should merely have to refer to the kindness his Royal Highness has shown to us on this occasion by taking the Chair, at very short notice, amidst the extreme pressure of business at the present time.

Sir FREDERICK NICOLSON :—

I feel it a very great honour, as the concluding act of my year of office as Chairman of the Council, to convey, as I am sure the Meeting will enable me to do, our most cordial thanks to your Royal Highness.

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## NAMES OF MEMBERS

WHO JOINED THE INSTITUTION BETWEEN THE 14th SEPTEMBER  
AND THE 31st DECEMBER, 1878.

### LIFE.

Simpson, A. H., Lieut. R.A.	Donaldson, John, Esq., C.E., late En-
Marshall, Lionel, Lieut. 20th Regt.	gineer I.N.
Malleson, G. B., C.S.I., Col. Bengal S.	Jones, Walter P., Capt. R.E.
Corps.	May, Henry J., Lieut. R.N.
Henriques, E. N., Lieut. R.A.	Hatherell, James, Major Scottish Bor-
Wales, N. Y. A., Major Otago Rifle	derers Militia.
Vols.	Godley, W. A., Major late 56th Regt.
Holdich, T. Hungerford, Capt. R.E.	Wilson, J. E. M., Capt. R.N.

### ANNUAL.

Wallace, W. E., Lt.-Col. late 18th Roy.	Lee, J. Stirling, Lieut. 13th Middx. Rifle
Irish Regt.	Vols.
Thomas, W. G., Capt. 25th Regt.	Cole, A. Lowry, C.B., Col. 17th Regt.
Walker, G. R., Major R.E.	Phillips, T., Col. 18th Hussars.
Macrae, H. R., Capt. Queen's Edinb.	Vernon, Granville, Capt. 16th Regt.
Rifle Vols.	Clench, E. Payton, Lieut. late Lond.
Creagh, A. M., Capt. 42nd Highlanders.	Art. Vols.
Fryer, John, Lt.-Col. 6th Dragoon Gds.	Lewisham, Lord, Capt. 27th Staff. Rifle
Holden, Robert, Lieut. Worcester Mil.	Vols.
Daniell, J. Townshend, Lt.-Col. late	Hutchinson, G., C.B., C.S.I., Maj.-Gen.
Indian Army.	Unattached.
Dixon, G. W., Lieut. 16th Middx. Rifle	Prater, C. G., Lieut. R.N.
Vols.	Daniell, E. L., Lieut. late 2nd Queen's
Furse, G. A., Major 42nd Highlanders.	Royal Regt.
Murray, S., Capt. R.A.	Merewether, G. L. C., Major R.E.
Grove, C., Capt. 15th Regt.	Foster, Chas. J., C.B., Maj.-Gen. Unatt.
Bryans, J. W., Capt. late 22nd Bombay	Walker, E. B., Capt. East Kent Mil.
Native Infantry.	Hewlett, T. G., C.I.E., Surgeon-Major
Bell, C. E., Lieut. R.N.	Bombay Army.
Beaufort, Francis, Lieut. R.A.	Goodwyn, J. E., Capt. 30th Regt.
Guyon, H. J., Lt.-Col. late Beng. Army.	Coleman, C. E. A., Lieut. 2nd West
Furley, John, Capt. late Kent Rifle	India Regt.
Vols.	Hamilton, J. B., Lieut. Lon. Scottish
Molyneux, R. H. M., Capt. R.N.	Rifle Vols.
Templer, J. G. E., Lieut. 74th High-	Bell, H. W. B., Lieut.-General R.E.
landers.	Goulbourn, Henry, Lieut. Gren. Gds.
Olpherts, William, U.C., C.B., Lt.-Gen.	Lloyd, Francis, Lieut. Gren. Guards.
R.A.	Warrender, John, Lieut. Gren. Guards.
Stevenson, N., Col. 87th Regt.	St. Aubyn, John T., Lieut. Gren. Gds.



# ADDITIONS TO THE LIBRARY AND MUSEUM DURING 1878.

## LIBRARY.

*Where London is the place of Publication, the word London is omitted.  
Where no size of Volume is mentioned, the Work is in 8vo.  
Where no date is mentioned, 1878 is the year of publication.*

### BOOKS PRESENTED.

- AINSLIE, Gen. Sketches here and there.  
*The Author.*
- AILEN, Robin. Fog Signals. Part II. Further Correspondence and Reports in relation to the utilization of Gun Cotton and Cotton Powder for Fog Signal purposes, and especially with reference to the development of the Sound Rocket. Nov. 1876 to March 1878. Folio.  
*Secretary, Trinity House.*
- ANDREW, W. P. India and her Neighbours.  
*The Author.*
- ARCHERS. The History of the Royal Company of Archers. The Queen's Body Guard for Scotland. 4to.  
*Harry Young, of Cleish, Esq.*
- ARMIES OF ENGLAND. The Volunteer, the Militiaman, and the Regular Soldier. A Conservative View of the Armies of England, past, present, and future, as seen in January, 1874. By a Public School Boy. 1874.  
*The Author.*
- AUSTRIA. Studien über Seetaktik und den Seekrieg. Zweiter Theil, "Über den Seekrieg." Pola.  
*Professor Ferdinand Attlmayer.*
- BERMUDA. Memorials of the discovery and early settlement of the Bermudas or Somers Islands, 1650-87. Compiled from the Colonial Records and other original sources. Vol. II, with Map. By Major-Gen. Sir J. A. Lefroy, R.A., K.C.M.G., C.B., F.R.S.  
*The Author.*
- BREEN, H.H., F.S.A. Warrawarra, the Carib Chief. A Tale of 1776. 2 vols. 1876.  
*The Author.*
- CANADA. Militia Report, 1878. Ottawa.  
*Capt. E. G. Selby Smyth.*
- CHINA. Chinese Translation of Von Schelicha's work on Coast Defence. Translated for the use of the Chinese Students at the Foochow Arsenal. 6 vols. *Commander Castle, R.M.*
- CLINTON, Col. Letters on the Policy of England in the present emergency. 1877.  
Ditto. International Pronunciation Table and Spelling reform, by A. V. W. Bickers. 1877. *The Author.*
- COLLISIONS Afloat. Causes which lead to them, etc. Pamph. Liverpool, 2 copies. *Anon.*
- ENGINEERS. Aide Mémoire for the use of Officers of Royal Engineers. Vol. I. 1878. Compiled by Col. A. C. Cooke, C.B., R.E. with contributions and assistance from other Officers.  
*The Secretary of State for War.*
- FOURNIER, F. E. Détermination immédiate de la Déviation du Compas par la nouvelle méthode des compas conjugués. Paris. *The Author.*
- GRAHAM, Col. Sir Lumley, Bart. Tactical Examples. By Hugo Helvig. Vol. II, The Regiment and Brigade. *The Author.*
- INDIA. Standing Orders for the Moveable Column of the Peshawur Force. 4to. Lithographed.  
Ditto. Standing Orders for the Bengal Native Infantry. 1820. Calcutta. *Capt. E. F. Fortescue.*  
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850, North Sea:—Noordzee or Ymuiden Harbour.

SECTION 4.

86, Spain, south coast:—Cadiz Harbour and approaches, with enlarged plan of entrance, and views.

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848, ———— Larnaka.

846, ———— Limasol.

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320, ———— Lake Superior; with plans of Superior Bay; Rock, Marquette, Ontonagon, Eagle, Agate, and Copper Harbours.

SECTION 8.

1638, United States:—Breton Sound to Dernière Island, including the Delta of the Mississippi.

SECTION 10.

455, North America, west coast:—Anchorage on the coasts of California and Oregon.

## SECTION 11.

- 713, Mauritius Island :—Port Louis.  
460, Red Sea :—Musaw Harbour.  
2599, ————Jiddah, with its approaches, and enlarged plan of Inner Anchorage.  
629, Africa, west coast :—Walfisch Bay Settlement, with enlarged plan of bay.  
663, Africa, east coast :—Tanga Bay and approaches.

## SECTION 12.

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North Sea Pilot, Part IV, 3rd edition, 1878.  
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Africa Pilot, Part III, 3rd edition, 1878.  
Tide Tables, 1879.  
Light Lists, 1879.

*The Lords Commissioners of the Admiralty.*

The French Staff Map, reproduced by The German Topographical Department, and used by them during the War of 1870-71.  $\frac{1}{320\,000}$ . 182 sheets.  
*Gen. Walker, C.B.*

Map of the Transvaal and the surrounding Territories. By J. Jeppe, F.R.G.S. Pretoria. 20=1°.

*Lieut. Bradshaw.*

2 Photographs. Torpedo boats.

*Yarrow & Co.*

Chart of the Bay of Navarino, used on board H.M.S. Asia, by Admiral Sir Edward Codrington, K.C.B., 20th October, 1827, in steering the fleet into the Harbour. It was pierced by several shot lying on the Admiral's Cabin Table.  
*Lady Bouchier.*

Synchronous Charts of the North Atlantic during August, 1873. Folio.

*The Meteorological Office.*

Plan of the City and Suburbs of Canton. Compiled by the Quartermaster-General's Department, Chinese Expeditionary Force. 1857.

Sketch of the Action of Cawnpore, &c. &c. Lithographed at the Topographical Department. 1858.

*W. F. Higgins, Esq.*

Maps (3) of the Battle of Gettysburg, July 1st, 2nd, and 3rd, 1863.

*Chief of Engineers, U. S. Army.*

Sketch of Attock and its Environs, from a hill near Attock Peak.

*Capt. J. P. Freeth, R.A.*

Map of Affghanistan. 8 miles to an inch. Sheets 7, 8, 9, 10, 11, 12, 13, 14, 17, 18.

*The Secretary of State for India.*



Map of Affghanistan, 14 miles to an inch.  
1871. Sheets I and II.

*Secretary of State for War.*

Military Staff Map of Central Asia and  
Affghanistan.  $\frac{1}{2,027,520}$ .

*Mr. James Wyld.*

Map of Affghanistan, Cabul, the Punjab,  
Rajpootana and the River Indus. 50  
miles to an inch. *Mr. James Wyld.*

Five Sheets Staff Map.  $\frac{1}{40,000}$ .

*The Belgian War Minister.*

Five Sheets of the Danish Atlas, in con-  
tinuation. *The Danish War Minister.*

### PURCHASED.

Maps to illustrate currents Events.

The Standard Atlas of Canada: to which are added Maps of the U. S. of  
America.—*Henry B. Walker.*

## MUSEUM.

### MILITARY.

#### MODELS.

##### *Purchased.*

Model,  $\frac{1}{8}$  size, of a 9-pounder wrought-  
iron Gun Carriage and Limber for  
R.M.L. Gun.

Model,  $\frac{1}{4}$  size. 9-inch Palliser Shell,  
with Gas Check.

Model,  $\frac{1}{4}$  size, of a 6.3-inch Common  
Shell with Gas Check.

#### MISCELLANEOUS.

##### *Presented.*

One of the two Chairs from the Cottage  
at Donchery, where the Emperor  
Napoleon III. and Prince Bismarck  
met after the Battle of Sedan.

*Lt.-Gen. C. P. B. Walker, C.B.*

Backplate of the French Captain Du-  
pont, killed at the Battle of Waterloo  
by a bullet which pierced his Cuirass.

*W. J. Bernhard Smith, Esq.*

Two Bows and two Arrows (one sup-  
posed to be poisoned), from the savage  
tribe of the Guaycurus or Mbayas,  
inhabiting the banks of the Pitcourayo  
River.

A Coat of Mail, made from the fibre of  
the Chaquar, a species of aloe, and  
quite effective to resist the points of  
the wooden arrows.

A War Mace, the most formidable  
weapon in the hands of a Mbaya.

Las Boleadoras; this missile is thrown  
with wonderful precision, from a con-  
siderable distance, by the Indians of  
the Pampas. The above are from the  
Collection of Arms of the Spanish  
Colonel Perez de la Sala.

*Monsieur P. P. de la Sala.*

Coloured Print of the Colours of  
the Honourable Artillery Company  
(Framed).

*Capt. G. A. Raikes, H.A.C., F.S.A.*

A Pair of Staples, found in the Camp of  
the Ashanti Chief, Amaquatia, when  
surprised by Sir Garnet Wolseley in  
1873. The Ashantees use them to  
secure their prisoners, by driving the  
staple over the left wrist, and attaching  
it to a log of wood, four feet long, and  
as thick as a man's leg; the iron  
ulcerates through the skin and bone,  
and the slave loses his hand, and  
perhaps his life. The operation is  
called "Putting the Slave in Log."

*Surg.-Gen. Sir Anthony Home,*

*V.C., K.C.B.*

Three bullet-proof Infantry Shields,  
made of Siemens steel plate, 3-16ths of  
an inch in thickness, and 14 x 13 inches  
broad. Weight, 9 pounds.

*H. R. Sayce, Esq., late*

*Lieut. 99th Regt.*

Combined Sand-bag and Haversack, for  
the use of troops of the field.

*E. H. Clark, Esq.*

Tibetan Sword.

*Surgeon L. A. Irving, A.M.D.*

A Trowel, for intrenching purposes, to  
be carried by infantry soldiers in the  
field. *Lt.-Col. R. Harrison, R.E.*

16-pound Blakeley Shot of 1864, with  
screws for fixing Gas Check.

*C. V. Boys, Esq.*



# NAVAL.

## MISCELLANEOUS.

A Basket, containing a Piece of a Cannon Shot. This Basket was on the Cabin-Table of Admiral Sir Edward Codrington, K.C.B., at the Battle of Navarino, on the 20th October, 1827. It contained papers which stopped the shot from piercing the other side of the basket.

*Lady Bouchier.*

A Board, with a copper-plate, with an inscription punched on it, claiming the Bonin Islands for and on behalf of His Britannic Majesty George the IV., on June 14th, 1827. Brought

from China by Commander E. J. Church, R.N.

*Admiral A. P. Ryder.*

A Medal struck in commemoration of Admiral Vernon's Victory and Capture of Portobello, in 1739.

*Admiral C. R. Drinkwater Bethune,*  
*C.B.*

A few small Relics from the Royal George.

*Gen. Sir Wm. J. Codrington, G.C.B.*

Part of the Treenail of H.M.S. Shannon.

*The Rev. Harcourt Skrine.*

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OF THE  
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THE NAVAL PRIZE ESSAY, 1878.

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GREAT BRITAIN'S MARITIME POWER: HOW BEST  
DEVELOPED AS REGARDS:—

1. FIGHTING SHIPS.
2. PROTECTION OF COMMERCE.
3. NAVAL, VOLUNTEER, OR SUPPLEMENTAL FORCE.
4. COLONIAL AND HOME DEFENCE; THE CLASSES, ARMAMENT, AND DESCRIPTION OF THE VESSELS NEEDED; AND THE ORGANIZATION REQUIRED TO SECURE A POWERFUL AND ECONOMIC IMPERIAL NAVAL FORCE.

By Captain PHILIP H. COLOMB, R.N.

“*Esto quod esse videris.*”

1. It would be difficult to suggest a naval subject capable of more comprehensive and exhaustive treatment than this, which the Council of the Royal United Service Institution have announced for the year 1877; and it may be a matter of regret to many an essayist, that he must compress into 48 pages his possibly overflowing thoughts on the grand theorem.

2. But I conceive that, willingly or unwillingly, any essayist who attempts to deal with the matter presented to him, must do so on the prescribed lines. He must be as full as the limited space at his disposal will admit; he must be as complete as his knowledge allows; and he must deal with his subject according to the classification of its component parts which is furnished for his guidance. I shall therefore endeavour to let these rules govern the observations contained in the following pages.

3. It is, perhaps, so far fortunate that these limits of classification have been drawn; for were “the development of the maritime power of Great Britain” left without note or comment, as the subject of the

essay, the views of the competitors might turn out so various and so contradictory, that an undue pressure would be placed on the shoulders of the judges, even if any really useful result were achieved. But on the other hand, an essay would never be complete which failed at the outset to grasp its subject as a whole, and to announce with what central figure the subordinate groups were to combine, in order that the picture might charm the eye with its beauty, and the sense with its truth.

4. My conviction is, that in considering our naval power and its development as a whole, we too commonly fall into the error which is sometimes apparent in our military designs. We are too apt in both cases to overlook the differences which exist in the circumstances of nations, and to regard our own empire as liable to the same dangers and amenable to the same military or naval treatment as all others. We thus commit a double mistake ; we suppose that all other nationalities present similar naval and military features—which they do not—and we fancy that we ourselves exhibit a correspondence in circumstances, temper, and character, with that which we have imagined to be common to all our neighbours. Amongst the nations we are like one of our countrymen who happens to own a foreign ancestry, and to carry a foreign air unconsciously. Such a man will often aim at the uniformity which he thinks he perceives around him, unaware of the peculiarities which others see in him, and which being fundamentally natural, can never be shaken off. If we look for it we can readily detect, in the spoken and written words of our foreign naval critics, their opinion of the singularity of Great Britain's naval position ; and sometimes perhaps we may trace a certain covert surprise on their part, whenever our naval policy appears to *follow* that of any other country.

5. History and tradition—our excellent friends if treated with intelligent confidence, but our mortal enemies if allowed an unrecognized sway—are in some degree to blame for this national failing. Many of our famous naval wars have been carried on with nations whose circumstances were not very dissimilar to our own. When the Hollanders fought with us, we both strove for the same prize, the acknowledged dominion of the Narrow Seas. The south and east coasts of England were matched against the shores of Holland. The conditions were alike ; the field of battle was localized, and close at hand ; so that if the Citizen Navy in its latter days imitated the dash of Prince Rupert, and carried the war into our rivers, the Royal Navy of the second Charles was glad to borrow the fighting formation of the enemy's fleet. Both nations, in short, fought on an equal footing, were liable to the same dangers, and experienced the same chances of success at sea. It was in the nature of things that their Naval views should agree, and should produce identical results in policy. In the French wars prior to those of the Revolution and the Empire, the Naval circumstances of France and of England did not so greatly differ. Each had a seaboard trade—vast for that epoch—and while each had growing colonial interests in the West and East, neither nation could be starved into submission by a blockade. When

the revolutionary war broke out, the relative situations of the two countries had not materially altered. If Canada had passed to England, England had lost the United States, and France still held her magnificent West Indian colony. If French influence in Hindostan was on the wane, Pondicherry was not the unimportant colonial item it has since become; and a very few years previously, the French had deemed it politic to maintain a fleet, numerically more powerful than our own, in the Eastern Seas. As the war progressed, the fleets, trade, and colonial possessions of Holland, combining with those of France, restored any balance which might have been overthrown by the progress of our Indian Empire. Lastly, to complete the picture; if at a later period of the war, England trembled under the excitement of a threatened blow from the camp at Boulogne, La Vendée, at an earlier time, might easily have become the stepping stone of England to a new conquest of France.

6. Thus the dim recollection of the glories of the past, often disinclines us to take that calm and firm survey of the present, which can alone dictate a policy capable of securing "a powerful and "economic imperial Naval Force." History is often allowed to sway us in one way, when, did we adopt its real teachings, it would show that that way was a treacherous bye-path. For in what degree, let us ask, does the British Empire of to-day resemble, in its naval aspect, that of any other country? And how far, with the world against us in arms, could we now adopt the naval policy of the close of last century, or be put to the shifts and expedients of a still earlier naval epoch? In none of her former naval wars did England begin with any tangible superiority in her favour: still less could she claim a monopoly of power on her side. When she won her higher place at the close of each war, she did it by the stubborn daring of her naval leaders, and by the superior moral and physical strength of her seamen. Her forces at any menaced point, seldom exceeded the nominal power of those of her enemies, and when she beat them, she did it in spite of the facts. If she now adventures into a naval war—even with the world against her—she does so with one absolute and one practical monopoly in her favour. In the marvellous constellation of naval stations with which she has spangled the ocean, Great Britain possesses an absolute monopoly of resource. She starts in a war with a connected series of *points d'appui*, which are of overwhelming value, and which cannot be rivalled by the rest of the world banded together. Formerly, the propulsive force of ships was common to all nations. Now that force is unequally distributed, and England possesses it in larger quantity, and in better quality, not only than any single nation, but than any moderate group of nations. The coal-fields of Wales produce a steaming fuel that has no rival, and in her great colony at the Antipodes, England holds alike the control of steam power there. In her iron, her inventive power, and her restless industry, she possesses advantages which may easily be added to swell the list of her superiorities at starting; but these she has always possessed, and has always used in achieving her naval supremacy, so I do not add them. But in her coal she has far more than the mere superiority



which the quantity and quality of her production supplies. Her coal-mines combine with her naval stations abroad to give that second "practical" monopoly of which I have spoken. Coal, before it can become a naval force, must find its way into the bowels of the war ship. England alone possesses the appliances for making this transfer in every quarter of the globe. Her enemies must commonly load with coal in neutral ports, in short measure, and in haste and fear. England alone stores her war ships everywhere within the security of her own harbours. Steam, which in popular fears "bridged the "Channel," in truth and in fact placed in our hands the means of barring every ocean highway to all but British ships.

7. But if the progress of time has submitted these vast powers to our control, it has not failed to add corresponding weaknesses and dangers to our Empire. The power which closed the naval schemes of Napoleon at Trafalgar, was the self-sustaining, self-contained, and self-reliant, eighteen millions of people who lived in the British Islands. However truly the last adjective may apply to the thirty-two millions who have succeeded their ancestors, the two first can no longer do so. In 1813, the British people lived on the produce of their soil. In 1875, that people required *side by side with every pound's worth of raw cotton for manufacture, one pound's worth of raw corn or flour for their sustenance*. In considerations such as the foregoing—which might be multiplied if space permitted—we must recognize one of the great changes in the Empire, since the close of the last naval war. That manufactures and commerce have enormously increased is a well understood fact, but this increase has not so much altered as intensified the conditions which were peculiar to Great Britain in earlier days. The state of the food supply, and the increased population dependent on it, are new elements in the problem, which materially alter the general result. The change is also complete in relation to those outlying colonies of whose enormous value as coaling stations I have spoken. In naval war, under the old conditions, a blow aimed at any of our smaller colonies would have been more dangerous to our prestige than vital to our power at sea. The capture or destruction of a coal depôt on British ground might now inflict a wound which would be well nigh fatal. Deprived of the supply which was absolutely necessary to their value as fighting ships, the British men-of-war in the vicinity must either fly from an inferior force, or yield to it; and the commerce which depended on their protection, must cease to flow.

8. What then is the British Empire in its maritime aspect? It is a vast, straggling, nervous, arterial, and venous system, having its heart, lungs, and brain in the British Islands, its alimentary bases in the great possessions of India, Australia, and North America, and its ganglia in the Crown Colonies. Through this system pulsates the life-blood of the Empire. Main arteries and corresponding veins lead east through the Mediterranean and the Red Sea to India, China, and Australia; west to America and the West Indies; south to Australia, Southern Africa and America, and to the Pacific. Capillaries the most minute, at the extremities of civilization, gather



up the raw produce of the nations, transmit it to the larger channels, which in their turn convey it to the heart. This tremendous organ having extracted all that is necessary for its own sustentation, forces the transmitted produce through the great main channels, and finally through millions of branching filaments to sustain and revivify the nations of the earth to their remotest borders. The life of an empire so highly organized, must hang by a thread. It is no mollusc from whose inert substance huge masses may be detached at will without much effect upon its vitality. It is a living organism whose parts are all inter-dependent, and highly sensitive in their relations. A stab at the heart may put it to death more suddenly, but perhaps not more surely, than the severing of a remote artery, or the wound of a "nerve centre."<sup>1</sup>

9. Assuming that this picture of the British Empire, its strength, and its weaknesses, is a true one, it is well to put the statement made in paragraph 4 to some closer examination. Do we in fact frame our naval policy in correspondence with the facts of our Imperial position? or, would the course we pursue equally fit Russia, France, Germany, or America? Are we recognizing to its full extent our practical monopoly of coal supply? Are we guarding these "nerve centres"—our coaling stations—with a clear notion of the effect of a wound there? Are the conditions I have sketched familiar to the naval mind of England? Do they form the ordinary argument of public writers and speakers on naval policy? To all these questions, I think we must give such answers as will confirm my statement. From the complications of a naval policy which is sadly driven and tossed by the wind of the day, we may occasionally extract a fact, a thought, or a statement, consonant with a general system; but the rule is the other way.

Take for instance the invasion scares which every now and then set our wits staggering. I hold that it is impossible for anyone whose habit is to regard our Naval Empire as a whole, to share in them. Let us take reasonable precautions by all means against invasion, when, as in the days of Napoleon, the political conditions are such as to render invasion the chief aim of our enemies. But if our precautions are such as will make the invasion of the United Kingdom more difficult, but will render its **BLOCKADE** by sea more easy, or leave any of these main arteries or nerve filaments—any of the chief channels of food supply, or trade—liable to be cut or blocked, can it be said that we are recognizing our Imperial conditions? Take again the harbour-defence cry, which at the cost of more than a million, built the "Glatton," "Hotspur," "Cyclops," "Hecate," "Hydra," and "Gorgon;" if it did not go further and share in the designs of the "Devastation" and her successors. The building of powerful ships which are not fully sea-going—which are more or less incapable of maintaining the ocean communications of the Empire—can only be justified on the assumption that the chief danger to it lies at the

<sup>1</sup> For my conception of the empire I am entirely indebted to the writings of Captain J. C. R. Colomb, with whose general principles of imperial defence I cordially concur.

mouth of the Thames, the Mersey, or the Clyde; at Plymouth Sound, Spithead, and the Medway. But if our enemies are to career at will across our lines of communication, while we guard their terminations at head-quarters, what will be left us to guard? Take again the exceedingly persistent struggle to produce "Cruisers" which shall be perfect sailing vessels, as well as perfect steamers, but necessarily sacrificing coal stowage, steadiness of platform, offensive or defensive power. Is this difficult enterprise embarked in with a clear conviction that these ships can always have a coaling station under their lee, an advantage of which their enemies are deprived? It is manifest that if the full rig of any ship be reduced to an insignificant auxiliary, she may be made by so much the more powerful a fighting ship. Our enemies' "Cruisers" will be forced to carry a sail power which is not necessary to us. When we submit our fighting ships to the inconvenience of full rigs, are we not throwing away one of the advantages of our naval position? Note again, the energetic development of the torpedo in which we are engaged. Setting aside the argument as to the relative value of particular forms of this weapon, is its development by us, subordinated to the conditions under which we shall carry on a naval war? The various forms of towing torpedo, as well as the locomotive weapons, tend to make attack cheap, and therefore to put into the hands of a weak and struggling naval power, the means of dealing effectual blows to a powerful navy. Their chief field of usefulness will be from a blockaded port, against the force blockading it. Are we wisely preparing to take the place of the blockaded instead of that of the blockading force? The fixed torpedo is a purely defensive weapon, whose only use is the defence of the land against a superior naval attack; is that to be the position of our land in any part of the world during the next naval war?

But some of the most striking facts as bearing on my view of our defective policy are to be found in our tendency to imitate what our neighbours do in shipbuilding. We built the "Inconstant" to rival an American design,<sup>1</sup> and the "Inflexible" to match an Italian one.<sup>2</sup> We can all remember how pressing our public writers were that we should have a rival to "Peter the Great;" and more recently Mr. Reed has used his powerful pen to urge on us the necessity of building "Popofkas." Why even the well-informed and judicious Council of the Institution could not wholly escape from the prevailing line of thought, and in announcing the subject for the Prize Essay of 1876, they gave war vessels "for coast defence" a prominent place, causing the talented winner of the medal to dash into an astonishing design for a "Popofka," which only an immature idea of the circumstances of our Naval Empire could have produced. In the general lesson which our public writers draw from the American War, I think we can detect similar misconceptions of the teachings of history when applied to our naval condition. No commoner warning is held up to us, than the destruction of American shipping by the acts of the Confederate "Alabama" and her fellows.

<sup>1</sup> See Mr. Reed's statement at the "Naval Architects," 6th April, 1876.

<sup>2</sup> Mr. Barnaby, in the "Times," 27th April, 1876.

It is asserted that our carrying trade is liable to be abolished on the outbreak of a naval war, in precisely the same way as the American flag disappeared from the seas. It must of course be granted that like causes will produce like effects, but it can hardly be allowed that if we are alive to our position, either "Alabamas" will be fitted out in neutral ports, or that "Sumpters" will escape from enemies' ports, for the purpose of preying on our commerce; or that if they were so launched, their lives would be so long, or their acts so fatal, as those of their Confederate prototypes.

The idea of an "Alabama" only arose out of the weakness of the Northern naval force at the outbreak of the war; and her long life and destructive action were due solely to the facts that there was originally no force to withstand or check her; and that when such a force was at last prepared, it laboured under precisely the same difficulties as to supplies—especially of coal—as the "Alabama" herself did. If, however, the conditions of our Naval Empire are only intelligently appreciated, and our naval policy framed in accordance with them, there will be so little hopes of a career for a future "Alabama," that she will hardly be equipped, but if equipped and started, her life will be a very short one. The guards of our lines of commerce will be beforehand with her, and will have the tremendous advantage of home supply, whilst she must seek in unwilling neutral ports, a scanty subsistence. So that though the career of the "Alabama" is really a warning to us, it is not the same kind of warning which it would be to America, Russia, France, Germany, Austria, or Italy. It might be quite right and sound policy in these countries to build "counter-Alabamas," because the conditions under which they must act will be the same as those of the original "Alabamas," which any one of them might fit out against the other. But it does not follow that a "counter-Alabama" is the true British answer to the possible "Alabamas" of her enemies. On the face of things, it would appear a safer policy to rely on, and fall in with, the great advantages which we stand possessed of in our permanent naval force, and our chain of naval posts whence our forces may draw their supplies.

10. While I thus draw attention to the central figure, round which my subordinate ones are to be grouped, and while I endeavour to show that this central figure, or idea, is not allowed due prominence in the naval pictures of the day, I must not omit to notice a growing tendency towards a better state of things. I have already in a note spoken of the aid I have derived from Captain J. C. R. Colomb's excellent writings, in my general conception of our Naval Empire. His more recent writings and speeches confirm me. In some of the utterances of Mr. Brassey, although in points I disagree with him, I think I trace a truer conception of our naval policy than I have commonly observed. In the papers of Captain Scott, on "the Maritime Defence of England," including offensive and "defensive warfare," read at the Institution on the 16th and 30th June, 1876, and in the discussions thereon, there is a great deal which is in accordance with a wide and clear view of our naval position. It shall be my endeavour to add, in however small a degree, to the force of



the current of opinion which seems turning here and there into a truer direction.

11. When, with the conception of our Naval Empire sketched in section 8 of this paper, and of the misapprehension to which we are shown to be liable by the statements in the next section, I find myself called on to proceed, I am met by a question of tremendous importance, the answer to which must dominate my whole scheme. Ought the British Navy to be regarded as an attacking or a defending force? To answer, as is commonly done, that it is a defending force—"Our first line of defence"—and then to complain that it is not developed as an attacking force, that it failed in Russia as the French Navy failed in North Germany, seems to me most dangerous ground to take up; illogical to a degree, and the parent of wasteful expenditure. If it is a defending force, let it be so developed, and let some other force take up the attack under its guard. It is almost as weak to answer that it is partly an attacking and partly a defending force; such a thought, if invested with the power of directing a policy, will probably produce a Navy resembling some of those ingenious pieces of furniture, which form sofas, beds, chairs, baths, or writing tables, at convenience, but which generally find their most useful functions in the lumber room. On the other hand, to look upon the Navy as an attacking force, is to ignore historical lessons, and few are prepared to support that position.

12. For my own part, I am clear that a "powerful and economic" naval force is only to be obtained by regarding it as strictly a defensive one. In saying this, I do not mean to deny that there are occasions and localities where isolated naval attacks may be made with advantage, but I contend that such things should not enter into the general scheme, and should invariably be met as the expedience of the moment dictates. In a short phrase, I look on the functions of the English Navy as being confined to preventing damage being done to us by the enemy, and to promoting and covering attacks. I think, also, that if history shows us that our Navy was rightly used in former ages to fill these offices, the changes of time have confirmed historical lessons, and made them more powerful than ever.

13. But let me put forward a few of the arguments which appear to condemn those illogical but common views just mentioned.

In those general summaries of Admiralty misdoings, with which a free press so often favours us, it has become a supposed platitude to say that that Board was overtaken by the Russian war "without a gun-boat," and would now be overtaken by any other war in the same presumed helpless condition. It is perfectly true that we had no gun-boats at the close of 1853, and that we proceeded to build both gun and mortar-boats almost by the hundred, as soon as war was declared. The charge against the Admiralty is, that the Navy was not in 1854, and is not now, prepared as an attacking force. But in answer, it may be pointed out that 1855-6 saw a large naval force specially prepared to attack the enemy; so that not a great deal of time was lost, nor did we suffer in any way from the delay; but also that though much of this intended attacking force got on to its ground, it really

had no effect on the duration of the war. Its one act was the bombardment of Sveaborg, which could not even take rank as a useful diversion of the enemy's force. It is true that work was afterwards found for the gun-boats in China and elsewhere, so that the economic failure was not so great as it might have been. But supposing no such use had been made of the force, the loss inflicted on the enemy by purely naval attacks could not have reached the cost of preparing them.

14. Sveaborg, in fact, represented the only kind of attacks which the Navy has ever made successfully—the bombardment of positions which can be reached from the sea. But we may run through the list of these on our fingers. De Ruyter, on the shores of the Medway, Rooke at Gibraltar, Nelson at Copenhagen, Exmouth at Algiers, Stopford at Acre; these actions are the only ones of any magnitude which were attended with important consequences; and it is remarkable that they were all fought by ships specially designed to defend themselves against ships, or as I should put it, by specially defensive forces. Another case in point on the other side, is the Spanish attack on Gibraltar. Here the attacking naval force was extemporised, and was certainly as powerful as the conceptions of the day could design; but it failed as completely as Nelson's attack on Teneriffe.

15. But when we have admitted the policy of looking on the Navy as a defending force, we must next point out the lines it should occupy; and here I may say that I think public writers fall into the gravest errors when they conceive English waters as the outer lines of an intrenched camp, to be occupied by the Navy, while the body of the place is held by a defending army. Such an idea might more reasonably have obtained at the date of the Dutch wars, and might have been forced upon us by the combined fleets of France and Spain at the beginning of this century. But if the unintelligent memory of the Dutch wars laid us open to siege or invasion from 1797 to 1805, the intelligent memory of that great peril should guard us from ever repeating the error. Insufficient blockading forces at Toulon, Cadiz, Rochfort, L'Orient, and Brest, permitted in 1805 a junction of naval forces against us which our individual superiority at sea alone prevented from being overwhelming. And in what condition, let me ask, should we have found ourselves, had Villeneuve carried out the Emperor's orders, and had he commanded ships individually as powerful as our own? Sir Robert Calder's action would have terminated in a loss to us; the Emperor would not have withdrawn his troops from Boulogne; and we should have suffered at least—invasion. But these public writers of whom I have spoken wish our Naval Policy to begin now, where it might have calamitously ended in 1805. We are to be prepared, say they, to guard our ports from sudden raids, and our shores from permanent occupation. Vast systems of "Harbour Defence," by torpedoes, by rams, circular iron-clads, and "Staunch" gunboats, these ought to be the very important, if not the chief objects of a true Naval Policy. The "protection of our commerce" is to be attained by fast cruisers, who shall meet and



destroy the fast cruisers of the enemy, just as the "Kearsage" met and destroyed the "Alabama." For fleets? Well, these writers have a strong notion that their time has gone by, and they say very little for them; while as to the blockade and the preparation for it—it is an old world notion necessarily to be abandoned in these days of steam and electricity.

16. Summarised, the rather vague policy recommended to us may be put thus into four theses. (1) The shores of the British Isles must in the first instance be preserved inviolate by a naval force close to them. (2) The cruisers of the enemy must be met and beaten at sea. (3) The enemy's fleets *may* be met at sea, and if so, should be beaten. (4) Some kind of naval force especially designed for attacking the territory of the enemy should be always kept in readiness. I am not sure whether those who are in the habit of advancing these theses separately, would admit that I correctly enunciate them now that I have placed them together; nor, on the other hand, am I sure that some of those who may read this paper will not commend the summary as the indication of a true policy; but it is in the advancement of such views, either separately, or together, that I see the strongest instances of a disinclination to investigate and accept existing facts, and to act in subordination to them. If there are any who altogether deny that I rightly state prevailing opinion, either as a whole, or in its separate branches, I would ask them to turn generally to the writings of the day, and to see where, and how often, the idea of blockade, or of fleets of observation, shows itself present in the minds of the authors. Also, whether the harbour defence ship, and the swift, unarmoured cruiser do not, with the torpedo vessel, almost entirely divide the empire of their opinions on naval construction?

17. Having thus set forth what would, in my view, be the wrong developments of the Navy, considered in its true light as a defending force, let me state what I consider the right development. It appears to me that our Navy has two, and only two great defensive functions to fulfil, namely, (1) to keep the enemy in his own ports, and to stop his supplies thither; and (2) to keep open the great sea-routes to and from the heart of the Empire—the Islands of Great Britain. If after these things are fully provided for, anything else remains to be done, certainly let us prepare for it in peace time; but I cannot imagine that anything else need be done, or in fact, would be done, if these offices of the Navy were completely filled, until we had to deal with an enemy as practically beaten at sea as Russia was when war began in 1854. Then indeed we may expect popular cries for naval *attacks* on the enemy; then indeed we may expect to see them made with materials hurriedly designed and brought to bear; but at least the statesman of such a day will be bound to consider these attacks as mere diversions, quite apart from the main purpose of the imperial effort.

18. Whatever functions the Navy may be expected, in the minds of those who busy themselves about it, to fulfil, it is certain that one of three views will prevail in dictating the method to be pursued in peace time. Some—chiefly those who are, and expect to remain

irresponsible—will be for modelling the whole Navy from first to last on a theory of probable war, and probable requirements then. Others—chiefly those who are so pressed with carrying out detail and the current work of the Navy now, that they have little or no leisure to look into a problematical future—will devote themselves first to the current wants of the day, secondly, to meeting the current opinion of the day. It is exceedingly unlikely that they will, or can go further. But those who have more leisure for thought, and are not so office-driven, will reflect that “a powerful and economical Imperial naval force” must grow in a constitutional soil, and under constitutional skies, which are both in themselves adverse to the production. The soil must be manured and worked, and the weather cheated, or the plant cannot be developed. In plain words, under the will of a popular assembly, very much driven by the eager but uninstructed opinions of the least informed and most pre-occupied of the people, the greatest caution is necessary not to push a theory of naval force too much into prominence, but having carefully mastered the broad principles of the proposed development, to carry them out in apparent subordination to the requirements of peace. England never has yet, and never will be sufficiently long under the dominion of a single set of minds to carry out a grand scheme of preparation for war in its entirety. I think it is the duty of an essayist to remember this leading fact, and consequently my next position is that the demands of peace should be in the first instance provided for. But while I lay down this dictum, I couple it with another. Not a single ship should be built which did not designedly occupy her place in the great scheme of preparation for war. It may be said that these things are not compatible, but I hope to show that we should have to submit to very slight inconveniences in peace time after all, while we gained the much greater object of being READY when war came.

19. Now let us observe on what clear ground we stand if we follow out the course prescribed up to this point. In the first place, we are taking for our basis only what actually is; we know for certain the geographical conditions of our Naval Empire, and we know exactly our naval wants in peace time. We are to combine these two clear, undoubted facts; our peace ships are to be built for our peace wants, but we are to see that above and beyond this, they will fall immediately into their places on the declaration of war: but only—and here is an important point—only as defensive weapons, and to preserve the naval status of the Empire, while it makes its attacks by other means. Unless we are prepared to say that the peace public ships and the war public ships are essentially different, the principle laid down will only call on us to strike out from the design of the peace ship all those elements which may prevent her taking part in the great scheme when the time comes; and to add such things as are wanting. Next, we banish from our minds all vague and indefinite notions of naval attacks, and we say in effect, “we maintain a free sea in peace time: nothing whatever is to be thought of the Navy at war, but this maintenance, until it is so secure that we have leisure and opportunity for special efforts in other directions.” But it is evident

that over and above the Navy which is kept up in peace by the direct pressure of a public opinion, largely moulded by the heads of commercial houses whose smaller agencies abroad carry on their business under the active protection of Her Majesty's Ships, the country has hardly ever shown itself averse to a moderate expenditure on classes of ships not directly concerned in commerce-protection in peace times; here our hands are freer, and these ships can be constructed directly and entirely with a view to further defensive war.

20. It is on broad and simple bases such as these, that I am prepared to rest my scheme for the "development of Great Britain's Maritime Power," and it will be found as I go on, that I shall advocate what may be thought startling changes: but that such as I do recommend, will be in entire subordination to these great principles, and will be backed by the logic of facts.

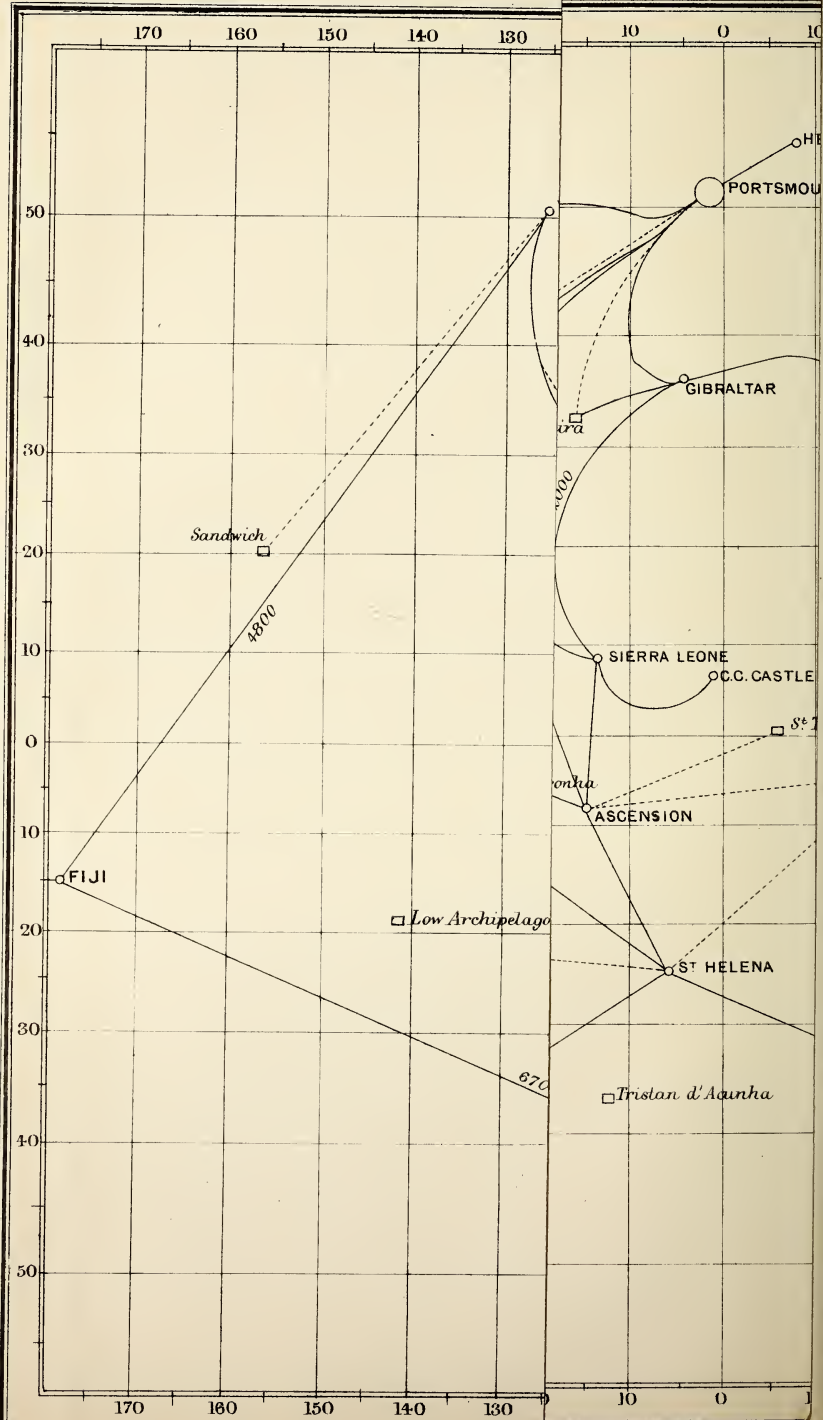
21. Turning now from the statement of general principles, to their application to the facts, we must look at the actual geographical position of our Naval Empire, and note what lines of communication it is imperative to maintain, and on what *points d'appui* the necessary forces are to rest. This survey will give us some idea of our probable requirements in war so far. We must then turn to an examination of our naval force actually in commission, and its geographical distribution. If we draw a comparison between these forces—that probably required in war, and that actually required in peace, we shall readily arrive at some conception of the modifications—if any—proper to be introduced into our peace establishment in order to make it economically valuable for war service. Finally, by assuming a case of war between England and a combination of naval powers as large as may be reasonably expected to appear in arms against us, we shall arrive at some conclusions as to the nature and extent of that force which should undertake the duties of blockade, or of meeting masses of the enemy at sea, in the event of our imprudence in peace time leaving us with incomplete blockading forces on the outbreak of war; or, which is perhaps as probable, in the event of its being necessary to open the war with a fleet action. In all these estimates of our requirements, we are, it is to be observed, to base our views on a series of facts as follows:—

- (1.) The Geographical condition of our Naval Empire.
- (2.) Our actual peace Navy.
- (3.) The Geographical condition of a possible naval combination against us, and the nature and distribution of neighbouring naval forces.

It is, I conceive, almost impossible to arrive at very erroneous views if this method of argument is steadily pursued. The result will be to show us in general terms the classes of ships, and the relative proportions of the classes necessary at the outbreak of a great war, whence we can deduce rules to be followed in providing our peace Navy. We can afterwards descend to those questions of propulsion, armament, and defensive arrangements, which should rule the construction of each type, and so conclude our consideration of the two chief heads set forth in the Council's memorandum, namely, our

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"Fighting Ships, and the Protection of our Commerce;" afterwards we can take the minor points of the "Naval Volunteer, or Supplemental Force," and our "Colonial and Home Defence,"—the latter being, as will be observed, really provided for, as far as naval forces go, in my general scheme.

22. We may now turn to the chart of our Naval Empire which I have prepared. In it I have omitted all reference to the continents enclosing this Empire, because it is sufficiently evident that if we can succeed in preserving the chain of communication between the different naval stations unbroken and free, we by this act preserve our mainland from naval attacks, and need not therefore concern ourselves with them.

23. As before observed (Par. 8), the chief arterial and venous trade routes are five in number, and run east through the Mediterranean to India, China, Japan, and Australia; south to Africa and South America, and round the Cape of Good Hope, or by the Straits of Magellan, and Cape Horn; south-west to the West Indies, and the Isthmus of Panama; west to the United States and Canada; and north-east to the Baltic. The existing nervous system, which in war time must govern and protect the commercial routes, is shown by black lines on the chart. Each line connects two possible naval stations on British territory, which are shown by the small circles with a dot in the centre. These circles are not in all cases naval stations properly so called, but at least they are, or can be made, coaling stations, if not regular depôts. It will be seen that there is another imperfect network of dotted lines connected with small squares having a dot in their centres. These squares represent ports belonging to the smaller powers, which might, in my opinion, be used in time of war to supplement our existing system of depôts where it is defective; ports belonging to the larger states cannot well be considered in this category, as with any of these we might be at war, and when at war with any of them, is just the time our Naval Empire would be imperilled. At such a time, however, we are eminently in a position for alliances with the smaller maritime states, as we threaten them all simply by the position we actually hold, and in consequence of that position, we are more able than any other nation to offer them protection and advantages. These plain lines therefore represent the nerves of the Empire, as it is along them that the force necessary to protect our commerce must flow. The stations at the extremity of the lines are the ganglia, where is stored up and reserved the nerve-force brought into play by the war ships. Whenever these nerves or naval routes, with their corresponding ganglia or naval stations, lie directly side by side with the main commercial streams, and where the stations are sufficiently close to each other, there our Naval Empire is in a state of geographical perfection; where, on the other hand, the naval routes lie apart from the commercial highways, and where the naval stations are few and far between, there the danger is most imminent, and the difficulties of preserving the trade routes intact are greatest. But the importance of these dangers and difficulties does not rest on such geographical considerations; it rather depends on the extent and



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nature of the trade passing over the routes in question. A route over which food for the mother country passes, is more important than any other over which no food passes; and of any two routes over which no food passes, that is the most important over which raw materials are conveyed, provided the other does not greatly exceed it in value. According to the "Stateman's Year Book" for 1877, and taking the figures quite roughly, as is proper in an essay of this length, the eastern trade route is as important as any in money value, as the commerce beyond the shores of Egypt alone may be taken at £150,000,000 annually, to which all the Mediterranean and Black Sea commerce must be added. Supposing one-third of this to go round the Cape, the eastern route beyond Egypt would stand at £100,000,000. The southern routes take perhaps £50,000,000 to the Cape of Good Hope and round it; while perhaps £12,000,000 goes round Cape Horn or through the Straits of Magellan. These two routes coinciding in the Atlantic, make the southern route in value £62,000,000. But, as much of the import from the Pacific is bread-stuff, and much of that from Australia is raw material, wool, &c., this southern route, with the West African and East American produce and import, will not be less valuable than the eastern route. The south-western route taking in the Panama trade, may perhaps stand for £20,000,000. The western route to the United States alone is put in the "Year Book" at £91,000,000, or, with Canada added, £110,000,000, but as some of the trade goes over Panama, and some round the Horn, the western route may be valued at perhaps £100,000,000, of which the chief part is food and raw material. The north-eastern route may be worth £80,000,000, of which the greatest part is food and raw material.

24. Without attempting to do more than sketch a basis for argument, I should be inclined to place the eastern route first in the scale of importance; the western next; and then the southern, north-eastern, and south-western.

25. Taking therefore the eastern route first, we observe that everywhere, from England to Hong Kong the naval route coincides with the commercial one, and moreover, the greatest distance between any two naval stations is that between Aden and Galle—a little over 2,100 miles—while the central point of that route is but 800 miles from Bombay. But this route is peculiar, inasmuch as it passes through territory not belonging to great Britain; but if the passage is to be made at all, Suez and Port Saïd must be considered to all intents and purposes as British naval stations. By alliance or otherwise with Egypt, England must have the control of the canal not as a neutral passage, but as a place where her war ships may replenish as in their own ports. A close alliance with Egypt is therefore, in war time, one of the first and earliest methods of protecting our commerce. But this route is geographically defective, inasmuch as the commercial route is prolonged very much beyond Hong Kong to the north, while the nervous system ends there. China is perhaps not sufficiently advanced to give us trouble by proclamations of neutrality, but Japan would be very likely to do so, and with Russian hostile or neutral ports to the north, our commerce might suffer. It must be under-

stood that we are not only concerned to keep these trade routes safe and free, but the mercantile mind must be assured of both, or commerce will shrink away. It would therefore be very desirable that either from Japan, the Corea, or China, some spot of territory should be obtained which is capable of being converted into a naval depôt. Places perfectly suitable are Port Hamilton, south of the Corea, and belonging to it, and the Island of Tsu-Sima belonging to Japan. As far as Hong Kong, this eastern route may be said to be geographically perfect, but if its geographical advantages are not taken full advantage of, the commercial stream is liable to menace from three quarters. France at Saigon and Pulo Condore lies directly upon the route from Singapore to Hong Kong. Spain at Manila, occupies a like position to the eastward; Holland might menace the Straits of Sunda and of Malacca, those two narrow channels through which, as through great railway junctions, the trains of goods must pass and repass, to and from China and Japan. Were those three countries to become hostile to us, the blockade or destruction of Saigon, Pulo Condore, Manila, Sourabaya, and Batavia, would probably be found imperative to avert paralysis of the China and Japan trade. When from Point-de-Galle, the commercial route, instead of going east, or north-east to the Indian ports, passes south-east to Fremantle, King George's Sound, and so to the other Australian and New Zealand ports, we come to a run of 3,000 miles between two naval stations. And this route is capable of being threatened along its northern part by Holland, issuing from her ports from Acheen in Sumatra to Koepang in Timor. Holland would be therefore our greatest danger in the Eastern Seas, did she become hostile; and in the politics of Europe there seems to me no change more perilous to England than that which would attach Holland to the German Empire in a war between it and the British nation. From the centre of the route from Galle to Fremantle or King George's Sound, Singapore lies 1,100 miles. But without the command of the Straits of Sunda, Singapore would be difficult of access. The war ships protecting this route might have to depend for supplies on Galle, and on Fremantle or King George's Sound, each not less than 1,500 miles from the centre of the route, which might be menaced from points not 600 miles distant. If Holland were inimical, and the blockade of her ports in the Sunda Islands incomplete, it might be advantageous to alter the route to Australia, and to pass by Aden to the Seychelles and the Mauritius. The only European power capable of menacing this route with advantages corresponding to our own, is France; but Bourbon in the immediate neighbourhood of Mauritius would not be a safe port of issue for ships hostile to England, and the possessions of France in Madagascar and its islands might be kept in check by our ships resting on such bases as Zanzibar and Johanna, or ports in Madagascar itself, for these are just the states to become our natural allies in universal war. After leaving King George's Sound, the eastern commercial route becomes again geographically perfect, until its extremest limits are reached in Fiji, which a far-sighted policy has united to the British crown. There is but one more commercial route to trace in this part of the world, that namely through Singapore



and Torres Straits to our Australian possessions. This route of about 3,600 miles is at present, I believe, destitute of naval stations except at its extremities. In war it could be menaced by Holland with advantages on her side, but on the other hand, naval stations might be established at a point or points along the more eastern part of the route, which would remove our disadvantages. Already in the possession of that superior fleet which we now have, and are bound to keep up along any threatened route, we want no more than smooth water anchorages for our bases of operations, and having them, our local superiority can be maintained; without them we suffer a theoretical disadvantage which becomes a very real one if our enemy on the spot is in possession of such bases.

26. On the whole it is to be observed of our great eastern lines of commerce, and its protecting nerves, or naval routes, that there is nowhere a distance of more than 3,300 miles to be traversed between any two naval stations, or points available as naval stations. If the wind is regarded as a neutral, blowing as hard and as long one way as it does the other—giving a ship all its help one time, and all its resistance at another time—then it follows that such a ship starting with as much coal in her bunkers as will carry her at a given speed 3,500 miles, will be efficient to guard any “nerve” of the eastern part of our Naval Empire. She could steam to the middle point of the “nerve,” fight an action there, and return either to the naval station she started from, or pass on to the naval station at the other extreme. She could very securely do this if she made an alliance with the wind, and so arranged matters that when it was foul, it should do her a minimum of harm, and when it was fair, a maximum of benefit. We thus see that the propulsive power of a war ship must be regulated by the geographical conditions of her service; and if we find that the geographical conditions of the British Naval Empire do not, in any part of the world, greatly differ from those just discussed, we shall also find that the propulsive power of our war ships may be governed by a uniform law. If on the contrary, we find that there are commercial routes requiring protection where it is impracticable to draw the naval stations within 3,300 miles of each other, we shall have to ascertain whether it is better to protect those routes by means of ships with special arrangements for propulsion; or whether the whole standard of propulsive power should be raised.

27. We now come to that commercial route which in par. 24 is roughly estimated as next in importance to the eastern, namely the western. There are no naval stations existent guarding this route and nearer to its middle point than St. John's Newfoundland, Halifax, Bermuda, and Nassau. On the other hand, there is no foreign naval station more capable of threatening that route than the Azores. But the Azores, unlike Java, Saigon, and the Philipines, are not to be looked on as a possible inimical naval station. On the contrary, one of our first acts, when the western route is threatened, must be a renewal of our old alliance with Portugal, giving us the command of the Azores as a naval station. Again, St. John's, Halifax, and Bermuda, lie almost on the western trade route, and no foreign territory except the

United States themselves would enter on war with more local advantages over the route than our own. In a war with the United States, western trade routes cease south of Nova Scotia, while to interrupt the northern routes to Canada, the United States have not the geographical advantages which we have for their protection. In a European combination against us, our enemies have no such grasp of the western routes as we have, and only the possession of the Azores could place them at all on a par with us. But as I have before said, the Azores can never be regarded as a menace to us so long as Portugal remains in possession of them. The western routes are therefore geographically perfect, and as the longest distance between any two naval stations is 3,200 miles (that between England and Bermuda), the propulsive powers of the war ships guarding the western routes may be identical with those necessary for guarding the eastern.

28. We next come to the southern route. A stream of commerce which sending branches east and west to Africa and America, parts in the South Atlantic into two great channels of trade—the one going round South Africa to join our eastern network of water carriage, the other passing round South America to dissipate itself along the whole line of American western coast until it reaches its source and terminus in British Columbia. Unlike the great eastern and western traffic, which is mainly conducted by steam power, and where the outward and homeward routes in consequence nearly coincide, the southern traffic is mainly conducted in sailing ships, and the routes do not wholly coincide. The outward route keeps to the eastward, north of the line, and then passes westward, south of it; that stream which rounds the Cape of Good Hope, not turning east until it has reached a considerable southern latitude. The homeward route from the east, on the other hand, passes close to the Cape of Good Hope, close past St. Helena and Ascension; at or near the line the western stream from South America and Cape Horn joins it, and the volume of traffic thus increased, trends away to the westward, and finally flows home north and west of the Azores. Ships guarding the northern portion of the outward route, must at present rest on the Home ports, on Gibraltar and Sierra Leone, the two latter lying perhaps 1,000 miles from the main stream. The only foreign territories on which forces hostile to this part of the route could rest, are Madeira, the Azores, and the Cape de Verdes, all belonging to Portugal; Cadiz and the Canaries, belonging to Spain, and the Gambia, belonging to France. But according to my view, Madeira, the Azores, and the Cape de Verdes, must be regarded as closely allied naval stations, open to our ships to the full extent, but closed to all who had designs on our great southern commercial route. Looked at from this point of view, the route to the line outward is geographically as defensible as the eastern route; there would be no spot along the route much more than 600 miles from a base, and ships stationed here with 3,500 miles in their bunkers would rarely be in alarm as to their coal supply. Deprived of the bases furnished by the Portuguese Islands, we should be, though still in a better position than any possible enemy not resting on those bases, yet still not so well off as

might be desirable. Our ships resting on Sierra Leone and Gibraltar must calculate on operating at 1,200 miles from either station; that is, they must be prepared to steam to a spot 1,200 miles off, fight there, and return, or steam another 1,200 miles in a different direction. That is, their coal supply must exceed that necessary to steam 2,400 miles. But in discussing the coal supply necessary for a ship protecting the great eastern routes, we allowed a steaming capacity of 3,500 miles; therefore any ship whose propulsive power is based on the necessities of the eastern routes, is so far competent to deal with the northern part of the outward southern route, even if she is deprived of her very probable coal depôts at Madeira, the Azores, and the Cape de Verdes. The northern part of the homeward southern commercial route is not geographically so convenient for defence as the outward route just treated of. There is a point in that route in latitude  $30^{\circ}$  north and longitude  $35^{\circ}$  west, which is nearly equally distant from all the English naval stations surrounding it, or, speaking quite roughly, 1,600 miles from St. John's, Bermuda, Barbadoes, Sierra Leone, and Gibraltar. That is, if there were no alliance with Portugal, our ships might have to steam 1,600 miles to that spot, fight there, and return 1,600 miles, making in all 3,200 miles. But after all, we are no worse here than we were in the far east, (paragraph 25), and the propulsive power of coal for 3,500 miles found necessary there, would be a sufficient supply even for this extreme case. But including as usual the Portuguese Islands of Cape de Verde and the Azores as our assured friends, there would be a quadrilateral of coaling stations, none of which were more than 1,100 miles from the most distant point within it. So that a ship furnished with 3,500 miles of coal, might go to the centre spot, and cruise, or lie there till she had spent nearly half her remaining coal, before she was called on to return for replenishment. On the other hand, setting Portugal aside, there is no power in so good a geographical position for attacking this route as we are for defending it.

29. South of the Line, no European State is geographically as well prepared to interrupt our lines of traffic as we are to secure them. Brazil, indeed, and the Southern States of South America, would, if hostile, seriously menace geographically the whole of the route south of the Line to the Pacific, and the northern portion of that to the Cape, and the Indian Ocean. But I think that these States must be regarded as either neutral or friendly. If allied with us, which would be their natural condition with their commerce at our mercy, all our routes in the South Atlantic would be practically secure. If neutral, our bases of operation must be Ascension, St. Helena, Simon's Bay, and the Falkland Islands. This quadrilateral is so much larger than the northern one spoken of in a previous paragraph, that there is a point within it, perhaps 1,800 miles from any English naval station, and supposing the South American States inimical, there would be some difficulty in protecting from such distant points, the outward traffic to the Cape of Good Hope, and both outward and homeward traffic to the Pacific, seeing that the track lies along the hostile coast. But here it is not impossible that nature has placed at our command



the means of meeting these difficulties, and of establishing a geographical control over this part of the ocean, sufficient for all practical purposes, even without alliances. A hostile Brazil would place Fernando Noronha at our discretion. Further south is Trinidad, with an anchorage, which though described as "unsafe" in the old days of sailing ships, might not be unavailable to the modern men-of-war as a coal depôt. South-east again lies Tristan da Cuna, with its "abundance of vegetables, bread, bacon, eggs, butter, milk, poultry, "beef, and mutton." This was a British naval station in 1815, and clearly might, at a time of pressure, come under its old rulers. True the anchorage remains marked "unsafe," but steam and chain cables have not been without their influence on the safety of anchorages. Trinidad, Tristan da Cuna, and the Falkland Islands, form a triangle within which there is no point at a greater distance from one of the three others forming it, than perhaps 1,200 miles, and therefore, with the coal supply premised for ships guarding the eastern route, the South Atlantic routes might also be guarded, even without alliances: but much more easily with those which would in all probability be made. The homeward route from the Cape may be dismissed in a sentence. It coincides with the nerve running from Simon's Bay through St. Helena and Ascension, and as these stations are not 1,500 miles apart, the geographical command of the track is complete. When we follow the eastern branch of the South Atlantic commercial stream round the Cape, we find a nerve 2,200 miles long, running from Simon's Bay to Mauritius, which may be broken at Natal, so that the longest nerve should not exceed 1,500 miles. At Mauritius we connect with the eastern nerve system which has been already discussed.

30. The western branch of the great southern trade route passes into the Pacific and follows the coast line to the north. The nerve system here is the most defective of any, and it is evident it cannot be preserved unbroken without alliances, or a class of ship altogether more fully provided than those which are capable of guarding the routes already treated of. There is nowhere in the world so large a space of ocean unstudded by British possessions, as the great triangle formed by the Falklands, Fiji, and Vancouver's Island. Nor are there within that space many points which are suitable for being converted into naval stations. There may be some spot in the Low Archipelago capable of affording a moderately smooth-water anchorage, and perhaps Easter Island might become a depôt as a temporary expedient; but France and America already possess the Pacific Islands most eligible for affording support to ships operating within the triangle. On the other hand, the whole of the American Pacific States south of Mexico, are so situated, that their interest would lie in an alliance with that power which had the chief command of the sea. It appears to me that on such alliances the safety of the eastern Pacific trade route must rest. If these alliances were not contracted by us, inimical European Powers would at least meet us in the Pacific on equal terms, a thing which it is of vital importance to us to prevent. Neglect on our part to form these alliances, and to place a suitable force in the Pacific to rest upon, and at the same time to sustain them,



would indeed leave our trade route open to the attacks of hostile "Alabamas," and would practically leave us no other resource but "counter-Alabamas," a state of things which would undoubtedly cause the disappearance of the English flag from those waters. Mexican ports might be less open to us than those more to the south, for if the United States were mixed up in the war, they would be able to bring pressure to bear on Mexico by land, and so force her into neutrality. In a European war, in which the United States were distinctly neutral, Mexican ports would be available to us so long as we held the sea on both her coasts. The Sandwich Islands being quite at the mercy of the power holding the sea, might also be calculated on to sustain that power, and so remove some of the defects exhibited by the Pacific as a British nerve-system. But I hold it futile to attempt the defence of the Pacific trade route by any description of vessels which must rest for their supplies on Vancouver, Fiji, and the Falkland Islands. With a friendly coast from the Straits of Magellan to Panama, I do not think it is so difficult to defend the trade routes of the Pacific with ships of the propulsive powers designed for other parts of the world. Were the United States hostile, and did they carry Mexico with them, the Island of Guadaloupe, with a moderately sheltered anchorage, lying directly in the track from Panama to Vancouver, might be made available as a *dépôt*, and would reduce the length of the nerve to one quite under control.

31. The north-eastern commercial route, and the method of preserving it intact, do not require much discussion. It is liable to interruptions only by the Great European powers, and we know by experience that so far as Russia is concerned, naval forces resting on temporary bases in the Baltic are quite competent to preserve it. The forces necessary to blockade those ports whence might issue our enemies' "Alabamas," would by the act of blockade preserve the trade route intact.

32. There remains now only the south-western route, that to the West Indies, to be dealt with ; but a glance at the chart will show that practically we have already done so. When the means are provided for protecting the southern and western routes, that which lies between them is already protected. Once past the line joining Bermuda and Barbadoes, the British traders come into a perfect network of naval stations, all close together, and offering a system of naval bases not equalled in any other part of the world.

33. We have now fairly examined the whole of the marvellous chain of posts which constitute the strength of the British Naval Empire. We have seen that, depending on British territory alone for supplies, ships capable of steaming at a given moderate speed for 3,500 miles, may everywhere, except in the Pacific, pass from point to point under steam alone. In the Pacific it is seen that, either ships must be independent of coal supply, or they cannot operate when resting alone on British naval stations ; but we also know that to be without coal supply is to lay the whole trade route open to depredators of the "Alabama" class. We see also that everywhere on our trade routes there lie either the territories of small States capable of alliances

offensive or defensive with us, or else those desolate spots which, turned into coal depôts, become all that we require. Our great conclusion therefore is, that our Naval Empire depends upon coal supply: that capacity for coal stowage is the first requirement of a British man-of-war. That she must use the wind as an auxiliary only—to be cheated when foul, and to be used when fair. Such, we see, must be our “propulsive policy,” while it can be that of no other nation at war with us. No other nation has these coal depôts under her lee even if she had the coal to place in them—and all other nations must therefore, in attacking our trade routes, reverse our propulsive policy. They must have great sail power, and their steam must be reserved for fighting purposes. It appears to me impossible for such ships to seriously attack commercial lines guarded by other ships practically independent of the wind; though they would of course meet British ships depending greatly on sail power on an equality.

34. The study of our geographical condition, therefore, determines the ratio which steam is to bear to sail power, and determines it altogether in favour of the former. If 3,500 miles was an impossible coal supply for a ship, then indeed our geographical studies would not have led to much; but we know that if all other things give way to this one quality of coal-carrying capacity, there is no difficulty about it, and I should myself put 4,000 miles at 5 knots, as the least amount of coal stowage proper for an English man-of-war.

35. But before leaving finally the geographical part of my essay, it is worth while to note how a sort of destiny has possessed us not only with a command over all the great commercial routes, but with the GATES of these routes. Egypt, it is well understood now, is tied to us by bonds of friendship and interest, and gives us the gate of the Red Sea route to the East; we already hold the gate of the Mediterranean, and the outer gate of the Red Sea. Galle is the gate leading to the east and south-east trade routes. Singapore, that of the China and Japan highways. The Cape of Good Hope forms the gate of all eastern trade routes in the southern hemisphere; while the Falkland Islands command the gate of all western roads by water there. Possessed of these gates, how are enemies to pass them? If they do pass them, what hopes are there of success against our trade, so long as we hold our chain of posts intact, with sufficient maritime forces resting on them? The answer is clear—None.<sup>1</sup>

36. But I have set out with a statement, or a promise, that my scheme for war purposes would rest on our peace requirements, and that the two things are not so antagonistic as they might be thought. Here I may be asked how I am to reconcile the tremendous expense of a fleet depending almost wholly on steam power with peace estimates? In answer, I deny the “tremendous expense,” and I assert that it is more than probable that a peace fleet formed on the principle that sail power is the merest auxiliary, would be cheaper than the present one is, where in most cases steam and sail fight for the mastery.

<sup>1</sup> It will be clearly seen that up to this point I have done little more than amplify the views of Captain J. C. R. Colomb on “Imperial Defence,” taking—as I am bound to do—the more naval view of the question.

This is a question of facts, and although I have not space to give all the facts, I can give as many as are necessary to prove my case. In the first place, let it be laid to heart that the estimate for coal to be purchased by the Admiralty was, for 1876, but £113,000; while raw hemp, canvas, and some minor articles of like nature, were expected to cost £123,000. Next, I must point out that I have made a very close examination of the economical results of sail power, as applied to an ironclad, through two years' service, and to a gun-vessel through some 15 months. I should state that the ironclad had a sail area equal to four square feet per ton of displacement, while the gun-vessel had 16 square feet. As to the ironclad, I found, I think beyond the possibility of doubt, that her masts and sails cost the country, partly in coal, partly in wear and tear, and partly in interest on capital, not less than £2,000 a-year over and above what the ship would have cost had she been entirely mastless. As regards the gun-vessel, I traced her minutely over a voyage of 6,100 miles, of which only 1,800 were done under steam, with or without sail, and 4,300 were done under sail alone. The wind was fair and strong for more than seven-tenths of the voyage, and the foul winds never exceeded the force of five. Under such circumstances, the resort to sail only, *delayed her voyage* by about 14 per cent. Supposing she had had no masts or sails, that the fair wind would not help her in any way, and that the masts and sails as existing did not in any way retard her when the wind was foul; then it is possible to say that this ship, while reducing her speed as above, did actually save 60 per cent. of her coal on this particular passage, so very favourable to such result. But being here concerned with the money cost, we must ask several questions. Suppose the ship, even as she stood, had steamed at the reduced speed forced on her by the resort to sail, would she not have made a probable saving? Can we truly say that fair winds, even without any sail, do not make an economy on coal? Is it not true that masts and yards do in fact greatly retard a ship when steaming against foul winds? What was the cost in wear and tear, and interest, of the sail power? Lastly, this ship had .3 of light foul winds to .7 of strong fair winds, suppose we allow .1 for the difference of force, and say that she had .2 foul to .8 fair winds; and suppose we strike a proportion, allowing that a ship must expect as much foul as fair wind, what shall we get as the result? To answer the last question, and the rest with it, we get her average gross saving at no more than 37 per cent. from which we must deduct the loss due to foul winds acting on masts and yards, and the gain due to fair winds acting on a mastless hull, as well as the probable saving due to the reduced speed. When I followed this gun-vessel to conditions where fairer averages may be taken, I got a gross saving of coal, without any *per contras* whatever, such as I have noted above, of 5 per cent. only. In this case the struggle to make a steamer a sailing ship, or a sailing ship a steamer, whichever way it may be looked at, has resulted in a ship very helpless indeed under all circumstances requiring propulsive power. Space does not permit me to go more into this question at present, I have brought this forward to throw the *onus probandi* on those who differ from me.



37. So far, I have got at two conclusions, our war ships must offer defence at sea, and they must have each a coal supply equal to 4,000 miles steaming at five knots, while their sail power is to be reduced to a pure auxiliary. I have now to consider how ships may be made most capable of offering this defence at sea, and I shall best do this by considering something of the classification of war ships. In the first instance; what induces classification at all, and what classification is best suited to British requirements? There always have been classes of ships, for the simple reason that it would have been uneconomical to have built but a single class. In the great naval epochs of the past, the classification was almost rigid. The line-of-battle ship, the frigate, and the sloop, formed the three great divisions into which all navies were then classed. The more technical "rate" then, as now, subdivided all classes of ships above the sloop, but the "rate," though it meant more than it now does, was not so complete a classifier as the terms used above. To-day the classification has very much broken down. We have the ironclad, the frigate, the corvette, the gun-vessel, and the gun-boat, as the nuclei of a possible classification; but "classification" as a part of a settled naval policy does not exist. One of the most prominent results of the older classification was an agreement among nations that each class of ship was designed to fight her fellows; one of the results of the present, perhaps unavoidable, want of classification, is that there is an idea that any ship should be ready to attack any other. Purely naval opinion is clear enough, that the old system was right; but public writers of power and influence are not wanting to say that naval opinion, in this instance, is wrong. Yet nothing has occurred as yet to shake the lesson of history on this point, and naval opinion is so far right to rest upon it. The economical results of a happy classification will be admitted on all hands; but those who have been in power have feared that with our present knowledge of the new naval forces and weapons daily growing up, any classification is as likely to be *unhappy* as to be happy. France is quoted against a classification, but I think when she produced many ironclads—or earlier, when she produced many paddle steam-frigates—of a particular type, she got a good economical result for the time, and the ships she built with an eye to classification are not more obsolete than those which we build without any eye to classification. Names will help us much on a matter of this kind, and so far as I can see, we should do well to adopt a simple nomenclature which would have the double effect of steadying our view, and of giving us an easy way of speaking of war ships. The term "ironclad" is after all a fallacious one, as there is as yet no settled system of placing the armour, nor any regulated allowance of its thickness or quantity. But all ironclads, whether large or small, whether with much or with little plating, are now expected to fight all other ironclads, whether success be probable or no. Most ironclads will assemble in fleets, as they do at this moment, and I should propose to call that class of ship which represents the old line-of-battle ship in this matter—a "fleet-ship." Then I see no reason why the next class should not retain the name of "frigate," the next "corvette," the next "sloop," and the



last "gun-boat." "Sloop" is a fine old name, without at present any home, I do not see why it should not take in all Her Majesty's Ships commanded by commanders, and find a home there. I suppose there will still be "dispatch vessels," "torpedo-boats," rams, &c., but these in my view are temporary and insignificant, and I leave them out of my scheme. Under these five classes I should range, as best I could, the existing Royal Navy, and all future ships should be designed to more and more nearly approach the ideal uniformity typified by the classification adopted. Before I go farther, I should point out that the "gun-boat" will be practically left out of my general scheme. Such vessels are more weapons of attack than of defence, they are quickly built and would always be prepared with reference to special localities and particular duties. The few employed in peace time have fields of operation in guarding those very minute commercial rivulets which flow up shallow waters in various parts of the world; and in war time their defensive powers would still be similarly engaged; they would never be expected to patrol the greater channels of commercial intercourse.

38. Taking first therefore the "Fleet-Ship," I am prepared to say that she should be a broadside ironclad of moderate dimensions, of moderate gun-power, and with a moderate thickness of armour. I say this with a full knowledge of all the shafts levelled at such ships, and in full view of the modern gun, the ram, and the three classes of torpedo; and I am prepared, I think, to show that "power and "economy" to use the excellent words of the Council, are not to be got for the fleet-ship, but out of this type. The touchstone of the whole matter is to be found in this combination of economy with power; because, as a moment's reflection shows, uneconomical power is not power in the true sense of the word. In approaching the question, a fixed sum of money must be assumed to be spent in a given time. The most powerful single ship which can be produced for this sum of money is not necessarily the most powerful naval force which the money can command. It is only so if the same money will produce nothing capable of matching her except a sister vessel. Nor would it be economical to produce such a single ship if she were so vastly superior to every other, that nothing could face her singly. The question would arise, whether she could be where she was wanted at the time she was wanted, or whether two or more ships could not be built which—only costing a like sum—would be as much superior to her when combined, as she was to any former single ship. The drift of this argument is in part perceived by those numerous writers who assert the demise of armour-plating, and who see in the Chinese "Gamma"—and "Delta," the answer to the "Inflexible."<sup>1</sup> They are quite right so far as they go, but they do not carry their argument sufficiently far. The "Inflexible" was an answer to the Italian "Dandolo," but was not an economical answer. If the "Inflexible" mounts only four 80-ton guns at a cost of £500,000, and if the "Gamma" mounts a 38-ton gun which she can fight at sea, at a cost

<sup>1</sup> *Vide* Mr. Brassey, in the "Times" of 30th May, 1877.

of only £25,000, it is pretty certain that so far as gun-power is concerned, the "Inflexible" is neither powerful nor economical. But then if this is admitted, we cannot stop with the writers alluded to, at the "Gamma" as the type of future gun-ship. The "Gamma's" fire from her one gun is slow, and not more certain than that of much smaller guns. If all nations now took to building "Gammas," it would very soon be discovered that the occupation of the 38-ton gun, as well as of all heavier, and some lighter types, was gone! No one in his sober senses would build and arm a "Gamma" to fight another "Gamma," or if he had already committed himself to the ship, he would speedily alter her armament, and substitute several lighter guns for the single heavy one carried by his opponent. Thus the "Dandolo" destroys herself and her guns together, by producing the "Gamma,"—a statement which, to many persons, will appear to say that we are in a vicious, circular style of argument in the matter of guns and armour. I, however, am assured that the "Dandolo" with her 100-ton guns and her heavy plating, forms one extreme, and the "Gamma" the other, of a system of experimental argument, which will bring us all to a happy mean between them. When you have a ship which, costing a certain sum, is able to successfully defend herself against two or more ships costing together the same sum, all by the use of guns and armour, then, so far as guns and armour alone are concerned, that type is permanent. If the "Inflexible" or "Dandolo" could reply, gun for gun, to the number of "Gammas" which could be built for £500,000, it would not be so easy to condemn her as opposed to a fleet of the latter class. It is because she can only reply to at best a very few of them, that she shows as an uneconomical power.

39. To regard this question in its true light, it must be remembered that against guns there are two kinds of defence—*resistance*, offered by armour, and *avoidance*, offered by a small target. The "Inflexible" is the extreme representative of the former; and the "Gamma" of the latter. If defence by resistance is offered, the attack can only meet it by increasing the weight and space occupied by the guns; as both of these are limited afloat, the numbers of guns carried by the attack, are limited and controlled by the strength of armour offered in defence. Armour-plating has in my opinion no other function than this. Invulnerability can never, I think, be attained. If, however, defence by avoidance is offered, then the attack reduces the size of its guns, in order to increase their number. It would be paradoxical to assert it as a fact, but it is well to contemplate the possibility of very heavy armour, combined with only numerous light guns in a single ship. It is quite true that such a ship would be comparatively inoffensive when attacking an ironclad, but what would the ironclad do with her guns which only just pierced under very favourable conditions; and what again would the ideal unarmoured ship with only a few guns do against the other's many? But passing this by, we see that by carrying armour you compel your enemy to take few shots at you in any given time; while if you carry a greater number of effective guns than he does, you compel him either to increase his armour so as to reduce

the number of your guns, or else compel him to abandon armour altogether. He can, as we have seen, only do this, by a more or less near approach to the "Gamma" idea, and if it is more costly to put afloat in "Gammas" a number of guns equal to those lighter ones with which you are prepared to meet them, your guns being numerous, then he has no resource except to build, armour, and arm, a ship of the same type as yours, and so fight it out with similar weapons on equal terms. This is the argument as regards guns and armour, and to me it is as clear as daylight, that on these grounds the heavy gun will remain, and that the ironclad will remain, but I doubt about the very heavy gun; and the very heavy armour. I do not think that there is as yet anything in the ram or torpedo to alter this prediction. It is impossible on the data available outside the Admiralty, to say exactly whereabouts this medium between the "Inflexible" and the "Gamma" will lie, but as it is necessary for me to assume a medium in terms of English armour and guns, I take it at the 18 to 25-ton gun, and from 10 to 12 inches of the present armour-plating. As to the latter, I must express a firm conviction of very old standing, that practically little has been done in the matter of armour for ships. I think that by the use of steel, of chilled iron, or by discoveries in the distribution of armour, or of all combined, its resisting power for a given weight will be probably much increased, whereas I do not see that the effective power of the gun is capable of very material increase irrespective of increased size and weight. The only point I make in the above selection is a security that my fleet-ship cannot be successfully attacked by guns of less power than the English 18-ton gun, and that this gun to be effective must engage her at less than 800 yards. These are moderate desires, and quite within our compass, and I suspect that such ships cannot be economically and successfully attacked with guns except by ships of like nature; but this will better appear later on. For the fleet-ship we have thus got four of her chief elements: namely, (1) a coal-carrying capacity equal to 4,000 miles at 5 knots; (2) a rig absolutely auxiliary; (3) 18-ton to 25-ton guns; and (4) 10-inch to 12-inch armour. If it is at this stage alleged against me that a single "Dandolo" coming amongst my fleet of moderately strong ironclads must put them to flight, as her armour is impervious to their guns, then I answer that to float a "Dandolo" my enemies must have long time and preparation; I will suspend the building of one or more of my fleet-ships when the time comes, in order to build at a less cost than that of the "Dandolo," and in a much shorter time, a sufficient number of "Gammas" to master her. This is setting aside what I might do with my moderate ironclads themselves in the way of rams and torpedoes.

40. In every class of war ship, I think a great principle should as far as possible govern construction. This is the principle of *duality*; everything should when possible be doubled, in order that the disorganization or destruction of one part, should still leave the fellow of it efficient and ready. No single chance shot, chance blow, chance accident, ought to utterly paralyze the ship; she should, to the fullest



possible extent, be provided with a second item to fall back upon should the first be destroyed. Thus, for the fleet-ship, she should be double below water—a ship within a ship—in order to allow her outer skin to be pierced without admitting water to the ship proper. In her compartments they should be so arranged that no two of them would sink her when filled. Her engines should be double, with a double set of boilers—each engine being capable of connection or disconnection with each set of boilers, or with all, or any of them. The two sets of boilers should be in a separate compartment, and if possible, one compartment should be before, and one abaft the engines. The engines themselves should be each in a separate compartment. The screws would of course be twin, and, I think, might well have gearing connecting each with the other when desired, so that one engine could work both in case of the other being disabled. But the greatest application of the dual principle should be in the gun armament of the fleet-ship. This should be double: a heavy armament to meet armour, and a light one to meet “Gammas,” torpedo vessels, and all other unarmoured ships. The heavy battery should be divided into two, so that a great disaster in one half battery will not affect the other. I should carry this duality to very great lengths in the larger ships. There should be two steam fire engines, each to do the duty of bilge-pumps and capstan engines, and the two capstans should be capable when manned, of taking the place of the steam fire engines. The whole, and half the pumping power should be capable of acting on any single compartment, and a double set of pipes would make the danger of accident twice as remote. In the smaller classes of ships the dual principle could not be carried so far, but I suspect it might go farther than we think for.

41. When sketching out the great principles which should govern construction in an ideal English Navy as a defensive force, I have to remember that it is to repel the gun, the ram, or the torpedo with success, and it is time that I should write the general principles I propose to adopt for these purposes. I have already mentioned the two species of defence against guns, namely, *resistance* and *avoidance*, and these also avail us against rams and torpedoes, though not perhaps to a like extent as against guns. I think each species of defence should be employed in every case. As against the gun, I propose to use armour for resistance, and to reduce the size of the vital target to the smallest limits. I am strongly disposed to think that I would not confine armour to the fleet-ship, but would employ it to a limited extent in the frigate. In the placing of this armour, I should follow a dictum on which we are all pretty well agreed now, although the principle does not appear in all past types of ironclads, namely, that the ship should be protected first, and then the guns—or rather, and then the men. As proper systems of compartments do in fact offer great protection to the ship, it does not necessarily follow that all, or even the greater part of the armour should offer no protection to the guns; on the contrary, I think it is only where compartments are absent that guns should be without resisting protection, and I can conceive a cellular hull without armour, carrying an armoured battery of



guns, with much prospect of success in action. But the fleet-ship, and perhaps the frigate, would in my scheme have their water lines, and their batteries both protected by armour, but its disposition will differ from any which has to my knowledge been as yet proposed. For the defence against rams, I offer in the first place the avoidance by manœuvring, but I am not prepared to incommode my coal stowage already fixed on, by any shortening of the ship for manœuvring purposes. I am quite ready to condemn excessive length for the attainment of excessive speed, but I must have my 4,000 miles of steaming power whatever be the consequence in length. I am strongly disposed to think, however, that a ship may often avoid a fatal crushing in her side by opposing resistance to it. With plating arranged as in the "Devastation" target of May, 1871, in two thicknesses, it is possible to back the butts of two plates by the centre of a third; if this vertical structure is again backed by a horizontal angle-iron or feather such as an iron deck represents, it would have great resisting power, and with an inner skin behind it might be successful against a ram. But if the great principle of duality, as applied to compartments, be adopted, I do not see how a single ram is to inflict fatal injury, and I would risk it. For defence against the torpedo, I rely very much on avoidance. The course of investigation into the torpedo question has not been, so far as public knowledge goes, to raise that weapon in naval esteem. As a harbour defence I have for the present nothing to say to it, but as a sea attack, with which I am now alone concerned, the Whitehead is the only species which is seriously feared. Reasoning from analogy, I should think it fair to suppose that the fear of the weapon will not increase as it becomes familiar to the Navy, and as those weaknesses which exist in every new invention are brought into view. But when all this is said, the weapon cannot be ignored, and the only defence of resistance that I know of is a proper system of compartments. If a ship is prepared to stand one exploding Whitehead without sinking, I suppose her to have used her defence by resistance to the utmost, and this she may attain by taking care that no two compartments when filled will sink her.

42. Thus far, for the purely defensive arrangements of a purely defensive British Fleet. But a defensive fleet is not necessarily inoffensive, on the contrary, much of its defence must rely on the fear of its enemies to attack. With what weapons is the fear to be established, and how are these weapons to be disposed? I have already committed myself to the gun, up to the moderate weight of 25 tons, and I have already claimed its disposition on this broadside as the best. To me it is an astonishing question which is commonly put—"whether 'is the bow or the broadside the most important fire?' because I have never heard a serious argument in favour of the bow fire. I know that an opinion in its favour exists, or is supposed to exist, because in a great many ships, the broadside is weakened, and very many terrible inconveniences, and dangers, submitted to in order to supply bow fire. But I have only heard it asserted in support of this policy, that as a ship must not expose herself to be rammed, she must be prepared to fight an end-on battle. But unless she is pretty close to her enemy,

and in a particular relative position, there is no objection in life to her presenting her broadside, and an end-on battle must become a broadside one after the lapse of a very few minutes. But here again, the question is one of fact, not opinion. It is certain, because a ship is longer than she is broad, that the broadside fire can always be made more powerful than the bow fire. It is also certain that the vertical target presented by a ship end-on is less than that presented by a ship broadside-on. I have examined the firing of some of our ships provided with bow fire, and find that bow guns of an average ship throw away 26 per cent. of their fire, under conditions when the broadside guns of the same ship only throw away 16 per cent. of their fire. But the idea of bow and stern fire has not grown up, as we generally suppose, on reasoned ground; we have been drawn into it by an historical process. Bow and stern chasers were in old days, and may be now, regarded as useful adjuncts to a ship's armament, and therefore there was always that idea to rest upon. The paddle-wheel occupying the space required for broadside guns, drove them to the bow and stern. As there was little space there, an increase in the power of the "pivot-guns" was sought as a substitute for their necessary reduction in number. Screw ships found the pivot-gun already established, and adopted it as their long-range weapon of attack. The naval mind was thus familiarized with the idea of "all round fire." The two merits of the turret ship as originally proposed, were its entirely armoured condition, and its "all round fire." There was a tendency to show that other arrangements besides the turret could develop "all round fire,"—so we got ships with guns placed ill for broadside fire, but well for bow or stern fire. And having such guns, controversy arose as to their relative values. It was never seen that to make all round fire important was the natural aim of those who supported the turret system, but that it was, with the screw ship in motion, and especially with the twin-screw ship, a matter of less vital importance. When it was as easy to turn the ship as the turret, why lay such stress upon the arc of training? In the result, the great merit of all round fire was given up, and the supporters of turrets—having already given up complete plating—claimed for turrets—a claim they still support—the power of mounting heavier ordnance than any other system. But meantime we had got the special end-on, and the special broadside fire into a good many ships—the real history of birth was forgotten—and ancestors were found for each kind of fire in questions of tactics which were practically younger than the ships themselves. On such grounds I throw over without fear the "end-on" fire; I decline to weaken the broadside for an advantage so problematical, and I prefer to be very strong in the directions where my strength would most naturally develop itself, to making myself everywhere weak. I am certain that my enemy must either fly, or let me get my broadside to bear on him, but I do not know any means of making him fight an end-on action if he does not choose to do so. I have, however, no objection to a light end-on fire as an adjunct to the heavy broadside fire; and I think that if the foremost and after guns of my heavy broadside

battery can bear a little more forward and after training than the others, it will not be amiss, provided it does not detract from the ordinary broadside power. Such is my present faith as to guns. As to the ram, I hardly know any class of ship to which I would not fit it. I am not so anxious for a "spur" proper, but I think that every class of ship ought to be able to ram her fellow without too much damage to herself, on any convenient opportunity. I am not so well disposed towards the torpedo. I think that it is not impossible a towing torpedo may be constructed worthy of a place in the armament of a defensive fleet-ship, but I have no belief whatever in the Harvey as a defensive weapon, and I exclude it without hesitation from my scheme. I have much more faith in the "outrigger," but as I hinted in the early pages of this paper, it appears to be the proper weapon of a blockaded, not of a blockading or patrolling force. There remains the locomotive torpedo, of which the Whitehead is the most celebrated illustration. If I leave this weapon out of my scheme, I must not be understood as rejecting it, but it is too young, too little known and too untried to take a place in a scheme which boasts of being founded on fact.

43. I think that I have thus far marshalled and discussed all the great principles which should govern construction, and it now behoves me to show their practical application to the classes of ships I have suggested as proper for our Navy. I shall here give no more than an outline, because the explanation of several completed designs would be foreign to the purpose I assume to be held in view by the Council of the Institution. I do not suppose that all specimens of each class will ever be identical in all respects, but I consider that they should be as nearly so as the gradual development of improvement allows. I think there would probably be two divisions of the fleet-ship class, the smaller for the more distant services, and the latter for blockade, and fleet work nearer home. I should put the displacement of these ships at 8,000 and 6,000 tons respectively, and probably the one might be called on to mount 25-ton guns, and the other 18-ton guns. The frigate would displace about 4,000 tons; the corvette 2,000 tons; and the sloop from 600 to 1,000 tons. I shall now proceed to describe a second class fleet-ship according to my design, and in doing so will compare her with an existing type of her own displacement. Such a comparison is necessary to fix our ideas and to show the advantages gained by adhering to the principles I propose. The first class fleet-ship would be of the same type, but larger in every way; while the frigate would in many respects be a smaller fleet-ship. The corvette and the sloop would differ in arrangement, but there would be between them a more complete symmetry than exists just now.

44. The existing type of ship which I have selected as my exemplar is the "Invincible" class: of which the displacement is 6,034 tons; the I.H.P. say 4,500; the heavy armament ten 12-ton guns; the light armament insignificant; the armour 8 inches thick to protect the vital water-line and not exceeding 6 inches elsewhere. The compartment arrangements are such that the two largest communicate by a supposed watertight door below water, and are together amply



sufficient to sink the ship when full. The inner skin does not reach the water-line, nor even the deck below the water-line, so that a leak below the water-line lets the water directly into the body of the ship. The class carries some 460 tons of coal, 160 tons of masts and sails. The weight of the hull, including armour and backing, is 4,000 tons, and of the armour itself 900 tons. The plating extends 5 feet below the water-line, and to about 4 feet above it. It is connected by armour to that of the main battery, which carries six 12-ton guns, mounted as broadside guns, in the usual ports, and above this main battery is a central armoured upper battery, the guns in which are mounted to train from a fore and aft position to one exactly abeam. The class is rather deficient in boiler power; and of course very deficient in coal stowage; at five miles to the ton, which is probably their average steaming power at five knots in smooth water, the class has no more than 2,300 miles in their bunkers. Their area of plain sail is about 24,000 square feet, or about 4 square feet per ton of displacement; and to enable the "Invincible" to carry this sail, she has 360 tons of ballast, otherwise useless, and a drag upon her.

45. The "Invincible" is thus, to my view, a second class fleet-ship. She has been designed to resist the attack of every gun of less power than our own  $6\frac{1}{2}$ -ton 7-inch gun, which penetrates 6-inch plating at 400 yards. It is part of the design that a fatal wound cannot be given at the water-line, by a gun of less power than the 12-ton. Some advantage has however been allowed to the compartmental arrangement, as a protection from the fatal effects of shot. As to the attacking powers of the design, immense, and to my view, undue advantage had been credited to fore and aft fire, and very great sacrifices have been made to protect the fore and aft guns by armour. In the first place, the area of side armour covering the main battery is 247 square feet per gun; therefore to mount five guns on the broadside would cost 1,235 feet of armour, or 2,470 feet for the double broadside; add to this the ends at 1,150 square feet, and we get 3,620 square feet as necessary to mount ten 12-ton guns in a single broadside battery. But to mount these guns as in the "Invincible," six on the broadside, and four fore and aft, costs 4,445 square feet, or 825 feet more: or, taking the armour at 6 inches with 10 inches of backing, a weight of 102 tons. Besides the actual weight thus lost, the height of the upper battery induces weight by carrying the gunwale up to it; and its moment above the centre of gravity has much to say to the necessity of ballast. The question therefore remains for those to answer who advocate the protected fore and aft fire, "Are you prepared to spend 100 tons of weight on it, when the whole of your heavy armament costs you but 300 tons? Is it better to increase your heavy armament by one-third, or to spend the weight in placing some of your guns so as to fire in a line with the keel?" In designing the propulsion of the "Invincible," the conclusion has been that coal supply is less important than sail power, and practically it is seen that it has been considered wise to spend 526 tons of weight on the development of sail power. I say nothing of the actual performances of the class under sail, for it may be an accident if they are not proficient in that respect.

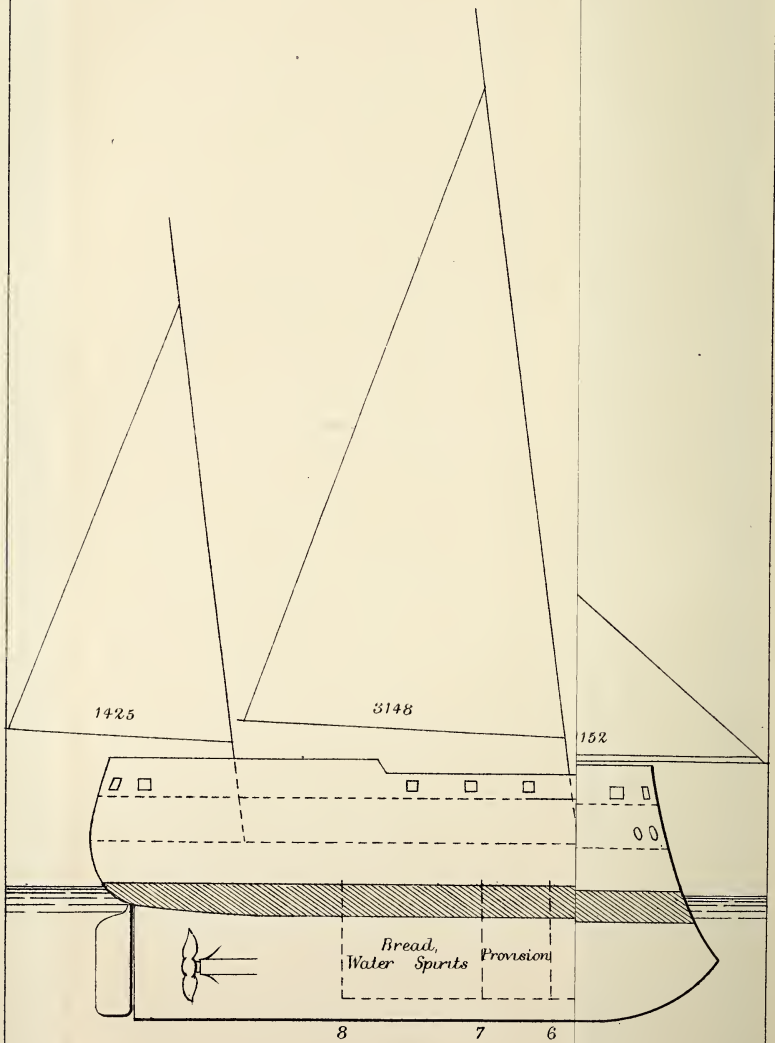


46. Now, it may be observed that in the case of a second class fleet-ship of 6,000 tons, I am prepared to advise a certain trusting to the compartmental system for the protection of the ship ; that I do not think it is wise to spend 100 tons of weight on obtaining a protected fore and aft fire ; and that I do not think it is wise to spend anything at all approaching 526 tons on the development of sail power.

47. I propose, in placing my views in the concrete, to take the lines of the "Invincible" below water as a fixed standard to work upon, and I propose very little alteration in her outward form above water, and practically none in her construction. In this way every proposed alteration will have a measure, or standard of comparison, and the rough outlines of my design may be criticised by an appeal to existing facts. It is necessary for me to state that as I have only collected the main points of the "Invincible's" design here and there, and by calculation and inference therefrom, my figures must in no case be thought rigidly accurate. In a paper of this kind, I have thought that a reasonable accuracy is all that is required. Turning now to Plate II, we have before us the profile or elevation of my design for a second class fleet-ship to supply the place, say of the lost "Vanguard." In the design, the bow and stern above water are both thrown in a little to make up for the placing of certain weights on the extremes of the upper deck, which are not present in the "Invincible." A light poop coming forward 47 feet is added, as a set off against the removal of the deck above the "Invincible's" upper battery. The whole of the gunwale fore and aft is lowered 2 feet, and the removal of this weight may be taken as margin to cover deficiencies ; otherwise the exterior of the "Invincible's" hull is practically unaltered. In the "Invincible" the lower deck is 2 feet 6 inches below the water-line, and in the "Outrageous" this deck is carried up 3 feet, to 6 inches above the water-line. Below this deck the "Outrageous" is divided into nine main watertight compartments. The distance from No. 1 to No. 8 bulkhead is the same as in the "Invincible," but between these there are in the "Invincible" but four main compartments—compartments, that is, with bulkheads carried up to or above the water-line. In the "Outrageous" there are at least seven. In both "Invincible" and "Outrageous," the double bottom extends from No. 1 to No. 8 bulkhead ; in "Outrageous" this double bottom is carried up to the lower deck ; in the "Invincible" it stops short 5 feet below the water-line, but in the "Invincible" it is 4 feet 10 inches wide at that point, whereas in the "Outrageous" it nowhere exceeds 3 feet 6 inches. The main deck of the "Outrageous" is 7 feet 10 inches above the lower deck, which gives a height of 6 feet 6 inches below the beams on the lower deck before and abaft the battery, and of 5 feet 8 inches under the battery itself. The main deck is 7 feet 7 inches from deck to upper-deck, or 6 feet 6 inches under the beams.

This may be thought low for the 18-ton guns I propose to put in the battery, but I see no reason why the axes of the guns should not be brought down in mounting, and 6 feet 6 inches will allow 10° elevation and 10° depression even to the 35-ton gun. It is most important to reduce the area of plating, and the consequent exposure

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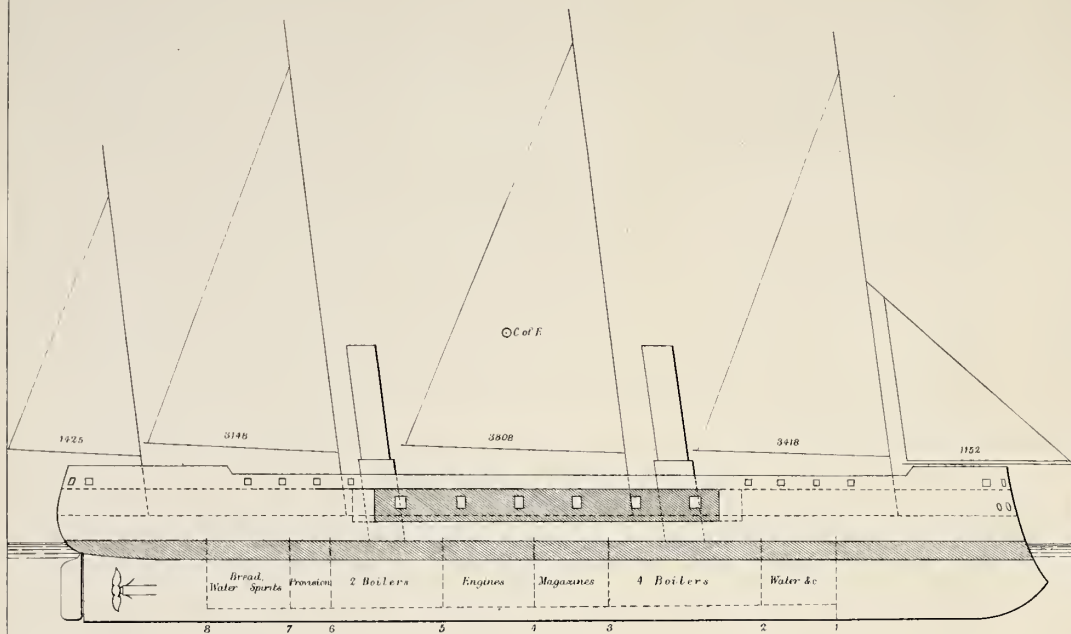






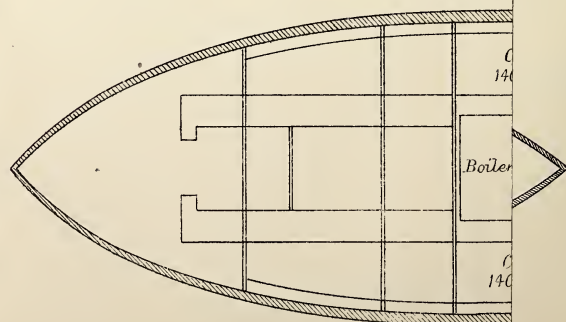
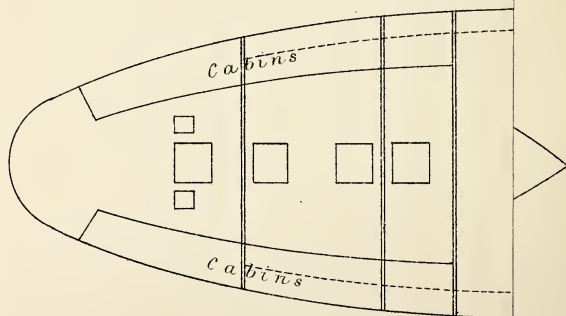
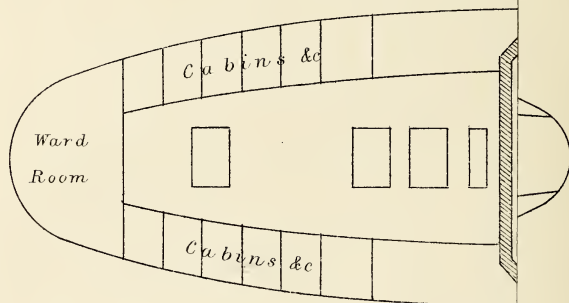
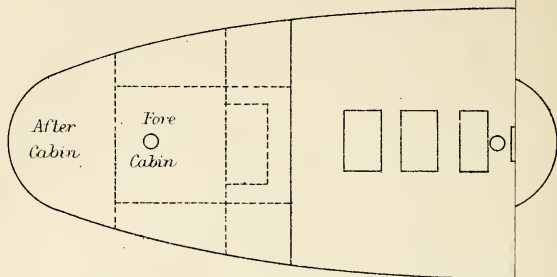
H. M. S. "OUTRAGEOUS"

Scale  $\frac{1}{2}$  in. to 1 Foot





H

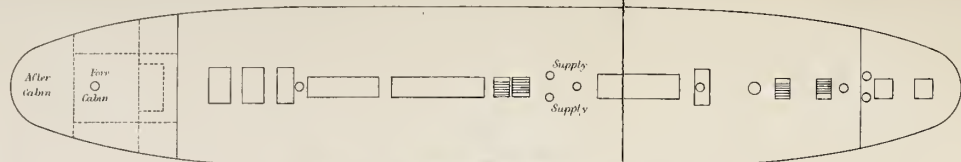


of the men under it. The upper deck gunwale is 4 feet 6 inches high, representing a parapet to admit of rifle fire over it. As compared with the "Invincible" the main deck of "Outrageous" is 2 feet 7 inches higher above water than her main battery deck, and the centre of midship part of "Outrageous" is 11 feet 2 inches above the water-line, while that of "Invincible" is 9 feet 10 inches. The upper deck of "Outrageous" is thus raised above water 7 inches more than that of "Invincible," and this statement concludes all that is necessary to say on the general structure of the proposed ship. I may say here that in proposing these changes, I am not forgetting either weights or moments, but as to the former, the simple raising of the decks does not increase them, and additional bulkheads, &c., are made up for by the removal of others.

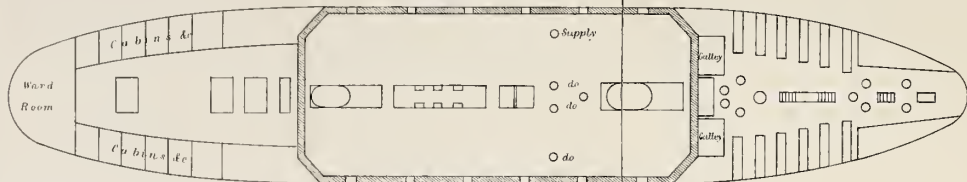
48. I come now to my arrangements below water, and my explanations will refer to Plate III as well as to Plate II. The ends before and abaft the main compartments may very well stand as they are; the usual arrangement of sub-divisional compartments properly tight, and without the treacherous but common sluice valves, ought to make the ends reasonably secure, so far as they go. The first compartment counting from forward in both ships would contain water, hemp cables, &c., and perhaps chain cables; though in "Outrageous" I might possibly stow them elsewhere with advantage. In the second compartment are 4 boilers and 20 furnaces, two-thirds of the whole boiler power of the ship. In the "Invincible" the whole boiler power is in this compartment, and this traverses the great "dual principle" to which I have committed myself. This compartment in "Outrageous" likewise contains in round numbers, 300 tons of coal stowed at the backs and ends of the boilers. The third compartment contains the magazines, which occupy the whole of the compartment in a fore and aft direction, and to within 4 feet of the inner skin transversely. The crown is the same distance below water as that of "Invincible." Coal is stowed *as a reserve* above the crown of the magazines, and in the wing spaces. The magazines are two in number, divided by a fore and aft bulkhead, each has three passages, which are lighted through No. 4 bulkhead from the engine room. The handing rooms are on the fore side, and each has two supply scuttles, and one return. The supply is protected from the lower to the main deck by a wrought iron cylinder 3 inches thick, so that bursting shell, or light shot, shall in no way interfere with it; and as the supply is direct to the battery, much less labour is involved in it. Passing to the fourth compartment we come to the engines, which I assume would be compound in the new ship. In the "Invincible" the engines are together, but in the "Outrageous" I propose to separate them by a fore and aft watertight bulkhead—still following out my principles. Abaft the engines is No. 5 compartment, which contains two boilers, each of five furnaces, placed athwartships between the shafts, with 140 tons of coal stowed behind them in each wing. In the "Invincible" this compartment takes the engines, but I prefer, as I have said, to have some boiler power abaft, as well as before the engines, so that there shall be a double system of communication between the engines and their prime



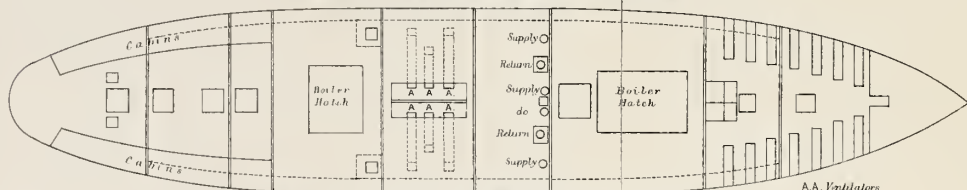
H. M. S. OUTRAGEOUS Scale 1/4 in to 1 Foot



PLAN OF UPPER DECK

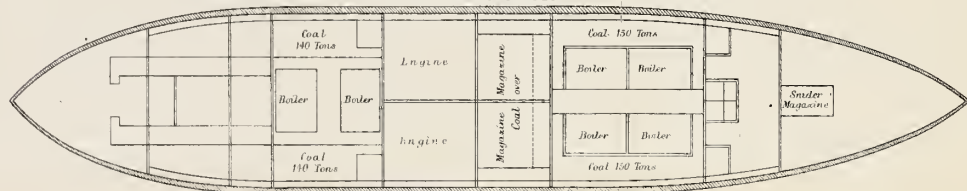


PLAN OF MAIN DECK



PLAN OF LOWER DECK

A.A. Ventilators



PLAN OF HOLDS

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mover. But now, as the space at my disposal for engines, magazines, and boilers, from No. 2 to No. 6 bulkheads, is exactly the same in "Invincible" and "Outrageous," it may well be asked how I am able to put into it boiler powder to 30 furnaces against the "Invincible's" 26; coal to very much over 600 tons, against the "Invincible's" 460, and powder to the extent of 56 tons, against 30 carried by the "Invincible?" The answer is simple enough.

I have rid my ship of light rooms, of a wasted passage, and of a shell room, and beside this the compartments are everywhere higher. As to the shell room: so soon as it was admitted that shell may be carried in the open, there was an end to shell rooms, and I have properly left the whole of the shell to be stowed as convenience dictates. The after compartments, as in the case of those forward already spoken of, might remain as in "Invincible" for the stowage of water and provisions. Ascending now from the holds to the lower deck, the observer would find it clear fore and aft, except as to cabins extending along each side. Unlike the "Invincible," there are no watertight bulkheads with assumed watertight doors, and the deck is comparatively lofty, except under the battery. But though there are no bulkheads, a reserve of buoyancy is got in a much more really secure way. The main bulkheads are prolonged for 2 feet above the deck, so that water cannot flow freely beyond them. As to convenience, these are readily stepped over; and as to safety, no errors or neglect of those on board can mar their good effects in time of trial. I may here observe that I have always thoroughly distrusted appliances such as watertight doors, sluice valves, &c., which require for their efficiency care and thoughtfulness. When nothing else can be had, then of course we must do the best we can with them, but in my experience I have never seen them *absolutely* necessary. But there is another novel arrangement about the "Outrageous" lower deck, which must be mentioned before we go further, and which points the moral to the foregoing observations. Hatchways leading to holds are now left usually open. I propose to fit them with sliding doors, to become airtight by upward pressure, as well as watertight by the usual clamps or screws. I am not aware that such a defence against torpedoes has yet been thought of, but it is very certain that if the air cannot escape out of a hold, or compartment, *very much* water cannot enter below. So far, I have kept to my principles; we have here a ship with two sets of engines, two separate sets of boilers, and two magazines. These are all enclosed in separate compartments, and no two of them, if filled, will absolutely sink the ship. In doing this we have not sacrificed much. The engineer cannot pass to his boilers without ascending above the water-line, nor can he pass from engine to engine except in the same way, but practically this is the whole of the trouble involved, and we can easily reconcile him to his fate by convenient voice pipes (always carried *above* and not *through* the bulkheads). Having thus secured all reasonable protection by means of bulkheads, we have to recollect that unless something is done to prevent it, the lightest shot may enter between wind and water, and may easily fill more than two compartments in an ordinary action.



The armour belt is thus to my mind a necessity of the day; but whereas the "Invincible" carries a belt extending (I gather) from 5 feet below the water-line, to 4 feet above it, I propose to cut off the upper 3 feet 6 inches of that belt, and let it extend from 5 feet below the water-line, to 6 inches above it. I am going to do this because I intend utilizing a fact which there has been great trouble to get at, but which by the researches of Mr. Froude, and the practical experience of Mr. Reed and Mr. Barnaby, has been brought out for use. The "Invincible" class does not roll. One of these ships may pass through a commission and never heel or roll more than one or two degrees. What does this imply as to the matter in hand? It tells us that a deck somewhere near the water-line cannot be struck by the shot—except the very distant shot—of another ship, at any considerable angle. The "Invincible" herself for instance with her upper battery guns depressed to even  $10^{\circ}$ , must get her enemy's water-line deck within 95 feet of her to strike it at that angle. If the deck is below water, of course she has so much the better chance, inasmuch as her shot penetrates above water and goes down afterwards. But what chance is there of getting a shot through even a lightly armoured deck, which cannot be struck at a greater angle than  $10^{\circ}$ , and that only when within 100 feet of the enemy? Most shot will in point of fact strike a water-line deck at no greater angle than one or two degrees. Even at  $5^{\circ}$ , a half-inch plate must have nearly the resisting force of a 6-inch plate struck at right angles, and in this view the  $\frac{3}{8}$ -inch iron which now covers the lower deck of the "Invincible" would be to her if the deck were brought up to the water-line, nearly as complete a protection as her present 6-inch vertical armour. On these grounds, I propose, I think reasonably, to take away a large slice of the vertical armour above water, and to clap it on in extra thickness from 5 feet below the water-line, to 6 inches above it, also in horizontal plating, and otherwise as will appear in due course. How much I am going to gain by the process may be briefly stated; taking the armour belt of "Invincible" as 5,292 square feet in area, the new area in "Outrageous" will be only 3,234 square feet, giving me a difference of 2,058 feet, which at an average of 5.3 inches of plate, and 10 inches of backing, is perhaps good for 229 tons. We may now pass to the main battery, about which little need be said at this moment. It is constructed in the usual way, and of the usual shape, and the only difference in principle between it and the main battery of the "Invincible," is the greater size of the foremost and after ports on each side. I have already advocated increased arc of fire for the guns in these ports, and I know no simpler way of giving it than by increasing the size of the ports on the fore-side of the foremost guns, and on the after-side of the after guns. I assume in settling the height of this battery deck at 6 feet 6 inches below the beams, that the guns can be so mounted as to fit that height, and the portsills can of course be lowered to suit the axes of the guns, as they are by the hypothesis, 1 ft. 4 in. above those of the "Invincible." I do not propose to have any doors in the transverse bulkheads of the battery; it is well to have those bulkheads as secure as may be, and the



convenience of an entry to the battery on its own level does not weigh a feather against the extra security of solid bulkheads. In one point I abandon my theory. I propose a single battery in this type, whereas did I carry out my views to their conclusions, I should divide it into two by a transverse bulkhead. The only reason I do not do so here is because it would interfere with my argument and mar its clearness. Were I designing a ship which was to be put afloat, I should make the sacrifices necessary to get this double battery, but it would be more open to argument whether I was right or not than I care to leave the question. On the upper deck rests the light armament to be presently described : and being on this deck, our attention is at once directed to the rig. I have already stated the reasons which induce me to adopt a pure auxiliary rig, and in this case I propose to reduce the area of sail by about one-half, giving 12,681 square feet. But as area of sail may be expressed in terms of horse-power with a given wind pressure, it is quite certain that in reducing the sail-area by one-half, I am not reducing the assistance to be derived from the sails to anything like that extent, and moreover, that if my new sails be made of strong canvas, in fresh breezes I shall still spread as much sail as I did with a full rig. Again, the "Invincible" was crank enough to require 360 tons of ballast, with a moment of (say) 7,000 foot-tons. If I pull down the centre of effort by one-third, and reduce the sail area by one-half, it is pretty certain that I may take away the ballast without any fear of consequences. I want, in point of fact, the righting moment of the fleet ship to be small, for in that way alone can I have the steady platform required for her guns, and for the safety of her hull below, and this being so, I am bound to reduce the heeling power which large sail area and a high centre of effort would give. As to the shape of the sails employed, I know of no other so useful as the "leg of mutton" sail. Set upon booms, it gives a fine spread of fore and aft canvas, and is equally efficient as a square sail when the wind draws aft. Moreover, this rig offers the least possible resistance when the sails are not in use, and requires the lightest possible spars. It would be foreign to my purpose to go more into detail on this part of the subject, it is enough to say that I propose this rig for every ship in the Navy without exception.

49. Having thus given a general outline of the nature of my fleet-ship, her rig ; how her hull and compartments are arranged ; where armour is placed ; and where and how the armament is distributed ; I must descend to particulars in describing the thicknesses of the armour and the exact nature of the armament, and as I propose so tremendous additions both to the offensive and defensive powers of the ship, as to be startling even to myself, it will be necessary to set out pretty distinctly how these advantages are gained. In effect I am going to substitute twelve 18-ton guns in the "Outrageous" for the "Invincible's" ten 12-ton guns. I am going to put this armament under 10-inch and 8-inch plating, where the "Invincible" has but 6-inch. Besides, I am going to carry a complete light armament not under armour, consisting of four 90-cwt. 7-inch guns as bow and stern chasers, and sixteen 20-pounders as broadside guns. As to the

water-line belt, I intend to put 10 inches along all the vital parts of the ship, where the "Invincible" now has but 6 or 8 inches; the ends remaining as I find them in that ship, that is from 6 to 4 inches. In judging of the reasonableness of these proposals, my gains and losses in the matter of weights must be considered. In area of plating I gain very largely, as the "Invincible" has (say) 9,737 square feet of armour, whereas the "Outrageous" has but 6,098 square feet. In this way the armour and backing of the "Invincible" may be taken at 1,090 tons, while that of the "Outrageous" only reaches 917 tons. The armament of the "Invincible" only weighs (including ammunition) 370 tons, while that of the "Outrageous" will be 655 tons. On the whole, therefore, this vast change is made at a cost of only 112 tons in weight! It is seen at once that the removal of the 460 tons of masts and ballast, not only gives me this weight, but a very wide margin over it. I may now take the ship as a completed design, and then the following table will exhibit the distribution of weight in the "Invincible" and "Outrageous," enabling a complete comparison to be made between the two.

	"Invincible."	"Outrageous."
Hull .....	2,945	2,945
Backing .....	166	103
Armour .....	924	814
Guns and ammunition .....	370	655
Engines and stores .....	400	400
Boilers and water .....	360	416
Anchors and cables .....	90	90
Masts, yards, and sails .....	166	60
Coals .....	460	620
Stores .....	84	84
Ballast .....	360	—
Provisions and water .....	140	140
Boats and gear .....	20	20
Total .....	6,485	6,347

On an inspection of this table, it will be seen that after the ship is fitted out completely, there is a gain on the side of the "Outrageous" over the "Invincible" of 138 tons, and I suppose there would actually turn out to be this saving, for though there are some additional bulkheads which must be added to the weight of hull of the "Outrageous," there is also a good deal of bulkhead work which is omitted, and must therefore be put down in her favour. I also consider that there would be a larger gain on the rig than 100 tons, both from the lesser weight than 60 tons of the rig itself, and also from a reduction in the weight of the stores. Carpenter's and boatswain's stores in the "Invincible" stand at 64 tons, and much of this would disappear under the new rig. I want, however, about 120 tons more weight, which this surplus gives me, to be employed as armour on the deck over the vital parts of the ship. Taking the iron of this deck in "Invincible" at half an inch, 120 tons will allow me to add 1 inch to it,

so covering boilers, engines, and magazines with 1½-inch horizontal armour. This may be assumed to resist all guns lighter than the 12-ton at 10° impact, if indeed the 12-ton itself would actually "penetrate." It may here be observed that the "Invincible's" deck over engine-room, and fore-part of boilers, is now unguarded by vertical armour to shot striking at an angle of 10°, but with only half-inch iron to resist them. I think, however, that a great deal might be done towards protecting the boilers and engines from shot above water, by stowing stores such as chain cables, shot, and hemp cables upon the deck above them; but these are details to be afterwards considered, as they do not necessarily enter into the design. But before quitting the subject, it may be pointed out that owing to the height of the lower deck of "Outrageous" above boilers and engine-room, reserve coal may be stowed below it to form a ready support to the iron deck, and to intercept splinters of shell, &c. As to the chance of penetration by shot entering not far above water, and tearing the deck up without actually penetrating it, but so leaving the water to enter in a sea way through the hole in the side, and then through the rent in the deck into the body of the ship, it must be remembered, that in dealing with a leak through the deck, you are *outside* it, and can readily secure it, unlike a wound in vertical armour directly into the body of the ship, a wound whose great danger lies in the fact that it must be dealt with from the *inside*.

50. Let me now very briefly compare the fighting and propulsive powers of the "Invincible" and "Outrageous" in order to see whether there is any doubt as to the complete superiority of the latter. In the first place, the "Outrageous" will be able to get to her ground under circumstances when the "Invincible" could not do so by reason of her short coal supply. When on the ground, the "Outrageous" will be able to select and keep her position, having the greater speed.<sup>1</sup> Next while every heavy shot, fairly fired by the "Outrageous," will go clean through the "Invincible's" plating, no shot from the latter will penetrate any of the vital vertical armour of the "Outrageous." The "Invincible" will receive six heavy shots for every five shots she gives to her opponent. She will get two 7-inch shells for every two 64-pound shell she delivers, and she will get eight 20-pound shells for every one she delivers. If the "Invincible" plants a shell in one of the engines, or one of the boilers of the "Outrageous," that ship can go on with her other engine and set of boilers; but if the same accident happens to the "Invincible" she is done. If the "Invincible" is fairly rammed anywhere amidships, she is destroyed as a fighting ship, even if she does not sink. If the "Outrageous" is rammed, even if the inner skin is penetrated, it is very unlikely to destroy her fighting power, and most unlikely to sink her. If a torpedo forces in the double skin of the "Invincible" anywhere amidships, she will either sink, or be forced to abandon the fight; whereas there is no point at

<sup>1</sup> I have not considered it necessary to put the question of speed formally forward in this Essay, as I am very well satisfied with the moderate speed of 12 knots on the mile. It is of far more importance to be able to maintain that speed, than to exceed it, and then fall short of it.



which the explosion of a single torpedo will sink the "Outrageous," and only a small area under the middle line, between the pairs of magazines and engines, which will destroy her efficiency as a fighting ship. On the other hand, it may be argued that owing to the withdrawal of the armour between the belt and the battery of the "Outrageous," she is more vulnerable than the "Invincible" at that point; and so she is—to the 12-ton or lighter guns—but then the "Invincible," in this particular fight, is met by the 18-ton gun, whose shot will go readily through that part of the "Invincible" up to the full distance at which fire could be opened. The question is not whether the "Outrageous" is vulnerable or no; it is whether she may reasonably anticipate victory over any ship or ships of her own displacement. It may also be said that the "Invincible" when disabled in her engine-power may escape under sail, while the "Outrageous" cannot do so under similar circumstances. In answer it can be said that the fact as to the "Invincible" is not true, unless there is a very strong breeze, and then the "Outrageous" is as well off; but it must still be borne in mind that the "Outrageous" is only half as liable to engine derangement as the "Invincible." But if the design of the "Invincible" is to be upheld at all in this case, it must be alleged that she can compel her opponent to fight an end-on action. Then indeed she will have the advantage, for the two 4½-ton guns of the "Outrageous" cannot compare with the two 12-ton guns of the "Invincible." But the question is, how is she going to do it? The "Invincible" may turn end-on to the "Outrageous" and advance on her. She thereby may compel the "Outrageous" either to turn towards her, or from her. She will not turn from her, because this is to give the "Invincible" the advantages she asks for. If she turns towards her, there must be either a ram, or a broadside fight in passing.

The "Outrageous" is better able for the ram, and very much better able for the broadside combat in passing; for as a matter of fact, the "Invincible" having relied on her end-on fire, will only have four 12-ton guns wherewith to reply to her enemy's six 18-ton guns in passing. In a fleet, the case is still worse; for an "all round" fire cannot under any circumstances be employed in a fleet. Your friends, and not your enemies, surround you, and compel you to fire only in certain directions. When you are strong in certain arcs of fire, you may abandon the other possible arcs altogether, and in your tactical system fill them up with your friends. The ship like the "Invincible," which is weak all round, but still has an all round fire, sacrifices her tactical capacity, and some of her strength is necessarily wasted over arcs where her friends lie. Any attempt to make a hostile fleet fight an end-on battle must result in failure, if the hostile fleet can throw its whole force into certain arcs of fire, while the other has surrendered that capacity. When the "Outrageous" is withdrawn from comparison with a ship of her own displacement, and taken on her own merits, it will very possibly be alleged that in giving up the reserve of *armoured buoyancy* she adopts a fatal error. This, as we have seen, is not capable of assumption in a comparative test as against an



"Invincible," but it may be asserted of her as against a ship of the same displacement, armed with numerous light guns. Six inches above water, the "Outrageous" is penetrable to the lightest guns; but this penetration will not let water into the ship: it will at the most let the occasional wash of the sea in upon the lower deck, to wash out again by means of the non-return scuppers with which that deck is provided. The vital part of the deck is, as I have shown, not penetrable to light guns at all, and if the fore and after part is so penetrable, it is, as I have pointed out, equally repairable; and as for the wounds in the vertical side above water, they also are under control. But the argument against giving up the reserve of armoured buoyancy goes further than this, and urges that the ship may be sunk below her normal draft by the ram or the torpedo acting below the armoured belt. Then a ship without armoured reserve buoyancy is at the mercy of the lightest guns. It is true that if the "Outrageous" sinks by six inches of mean draft, she is then open to wounds from the lightest guns between wind and water, and if she is first sunk to that extent by not less than 180 tons of water being admitted below, she may be altogether sunk by a sufficient number of the lightest shot, provided that no means are taken to avoid that disaster. But these means are existing in the "Outrageous." In the first place she must sink 2 feet 6 inches, which represents more water than will fill both engine-room compartments<sup>1</sup>, before the water admitted by light shot can flow over the deck at will, or down the hatchways. I should decidedly carry up the combings of many hatchways—those from boiler and engine rooms—by iron bulkheads with strong glass panes, to the main deck, and by this means remove the ingress of water below still further, so that it would require a great number of light shot to actually sink the "Outrageous." Thus the armoured reserve of buoyancy is not improperly given up. But I think it is altogether fallacious to argue in this way, on the actual merits or demerits, so considered, of ships of war. All ships of war are, and must ever be, destructible by some processes. That ship is the better type, which, while being less destructible than the other compared with her—which costs an equal sum—is more destructive. If this method of argument were adopted and firmly adhered to, we should long ago have reached a permanent type of war ship.

51. But I have to maintain my structure not only against the "Invincible" type, but against any other ship or combination of ships which can be launched against her for the same amount as she cost. Say the "Outrageous" will cost £250,000. Some other nation may propose to match her by unarmoured "Gammas." These "Gammas" to be effective, must carry the 18-ton gun, and will not, I suppose, cost much less than the others, or say £25,000. Ten of them may therefore be put afloat for the price of the "Outrageous." But what hopes can ten, or even twelve, "Gammas" have of mastering one "Outrageous?" She will certainly reply to them gun for gun; for she carries 32 guns, every one of which is effective against the

<sup>1</sup> They hold together to water-line, 684 tons.

"Gamma," and even her heavy guns alone number as many as are, or can be floated against her. We have in point of fact got in the "Outrageous" one form of this ultimate mean, of which I have previously spoken: a ship which cannot be met in an artillery combat with any prospect of equality except by a sister vessel, or by one or more vessels which in the aggregate cost more than the "Outrageous." But the ship is liable to be met by weapons supposed to be cheaper than guns: namely ram vessels pure and simple; and torpedo vessels pure and simple. We have already seen that the "Outrageous" is by her construction less liable to damage by these weapons than the "Invincible," but it must be shown also that she is less open to their attacks. It is her superior gun-power which effects this object, just as it made her less open to the attacks of "Gammas." Supposing the "Outrageous" to be approached by a light torpedo vessel from ahead or astern, the "Outrageous'" fire is more dangerous to her than that of the "Invincible," for the bow and stern chasers of the "Outrageous" can cross their fire to a very considerable angle, whereas if the approach is made the least on her bow or quarter, the "Invincible's" fire is practically inferior. But if, as would probably be done, the attack be repelled by broadside fire, the advantage is wholly and tremendously on the side of the "Outrageous." The pure ram will be armour-plated, and cannot be touched by the light guns of either "Outrageous" or "Invincible." If she therefore approaches either ship end-on, the "Invincible" has the better chance against her, provided the ram has no more than 8-inch armour. But if the ram carries 10-inch armour, the "Invincible" can do nothing with her either by bow or broadside. But it is pretty certain that the ram approaching on the bow or stern must expose herself to the broadside fire of a properly manœuvred ship, long before she draws near enough to make it dangerous to present the broadside to her. A ram, with even 10 inches of armour, will have some hesitation in running through the fire of six 18-ton guns, when she knows that her blow, even if delivered, will not be fatal. In any case, it is to be noted that the "Invincible" cannot touch her under such circumstances, whereas a single missile from the "Outrageous" may sink her.

52. Here I may leave my leading type of ship, on which I propose that all others, whether fleet-ships or smaller vessels, should be formed; but I must not quit her entirely without adverting to the question of her stability—a question which the naval architect at least will call upon me to answer. I have had neither the time nor the data necessary for accurate calculation, which indeed would be out of place here, but I have assured myself of the safety of my structure, by very simple and plain considerations. In removing the "Invincible's" masts and yards, I took away from her a moment of 4,000 foot-tons above her centre of gravity, and in removing her ballast I took 7,000 foot-tons below it. I was therefore 3,000 foot-tons worse as regarded moments than before, but still 4,000 tons better than the "Invincible's" original design. In taking away the Invincible's batteries and armour, I removed 8,800 foot-tons of moment above the centre of gravity, but in placing the battery and armour in "Outra-

"geous," I gave her 10,000 foot-tons of moment, so that by all the operations to this point I had sacrificed 4,200 foot-tons of moment, but was still 2,800 foot-tons better than the original design of "Invincible." Additional powder in the magazines gave me 340 foot-tons, additional boiler power 560 foot-tons, additional coal 1,000 foot-tons, and so on, so that on the whole, I do not calculate on being more than 1,000 or 1,500 foot-tons worse than the "Invincible" when ballasted; then as I had so dealt with the sails as to reduce their heeling power by *two-thirds*, I conceived that I need not, in so rough an outline as this, go further. In any case I have left a very wide margin for possible errors. The raising of the decks will have had some effect to reduce this margin, but on the other hand the lowering of the gunwale and its attendant weights and other things which have not been counted, would tend to restore the balance. If the worst came to the worst the whole battery might come down lower, or even two guns, and the corresponding armour be moved. But I am of opinion that the stability of the structure is not materially compromised as it stands.

53. I have been very full, and as accurate as I consider permissible, in describing the "Outrageous," because she is strictly a typical ship for all the most important classes in our Navy. The first class fleet ship would simply be a larger ship of the same type. She should carry 25-ton guns, and 12-inch armour, and as her cubical contents would necessarily only grow below water, I take it that I am safe in assuming that 8,000 tons' displacement would give her twelve 25-ton guns. The upper-deck armament might be increased in numbers, but not necessarily in weight of metal. The object of her design would be, as in the "Outrageous," to meet any force of artillery which could be floated for her cost, on at least equal terms, and to throw back the chances of successful attack at sea by rams or torpedoes. It would be true that she could not meet an "Inflexible" on equal terms, but that ship would be met at less than her own cost by "Gammas," rams, and torpedoes, which she has not the same power of repelling as the "Blunder," by which name my first class fleet-ship may be referred to. A second class fleet ship meeting a first class fleet-ship would not necessarily fly from her, but it would be no disgrace to do so after a fair fight and a sufficiency of damage; something must always be allowed for the chapter of accidents, and the shot of even 25-ton guns must strike pretty fair to penetrate 10 inches of armour. On the other hand, a shell from an "Outrageous" might enter a "Blunder's" port, or explode down a hatchway, and might make it convenient for her to abandon the fight for the time. It is, however, not to be expected from my point of view that an "Outrageous," costing £250,000, should be asked to meet, in fair fight, a "Blunder" costing £333,000, though it is expected that an "Invincible," costing a like sum to "Outrageous," ought not to fly from her on the open sea; and it is said that if she must do this, she has failed in design.

54. The frigate of 4,000 tons would, on the same lines as the "Outrageous," be 245 feet long, 48 feet broad, with 19 feet 8 inches mean draft of water. I gather from the rough calculations I have



made, that she might carry 7-inch armour, where the "Outrageous" carries 10-inch, and her heavy armament would consist of twelve  $6\frac{1}{2}$ -ton guns. Her light armament would consist of one 64-pounder as a bow-chaser, and one 64-pounder as a stern-chaser, with five 20-pounders on a side as broadside guns. The design of this ship would be to compel any intending opponent to carry at least 9-ton guns, and to give "Gammas," rams, and torpedoes as little chance as possible of successful attack. In strict analogy with the "Outrageous" and the "Blunder," the "Ramshackle," as I may call my frigate, ought to carry 9-ton guns, but I suspect I should find a difficulty in getting a 4,000-ton ship to carry twelve of them under 7-inch plating, though if it turned out that she could carry ten of them, it might be well to reduce her to that number. The difficulty in the 4,000-ton ship is height, and the moment due to it. There must be sufficient height to pass fore and aft under the battery in any ship on the design of the "Outrageous," but a proportionate height in a 4,000-ton ship would only give about 4 feet 6 inches between the water-line deck and the beams supporting the battery, which would be too low. The only way I see open is to increase the height to (say) 5 feet 6 inches, and to reduce the moment of the battery by a corresponding reduction of its weight, which would only give me twelve  $6\frac{1}{2}$ -ton guns. The place of the "Ramshackle" would be in light squadrons, or single ships guarding the main commercial routes, and she would be intended to take the place of the existing unarmoured frigate.

55. I must pass rapidly on with the other classes of ships, for both time and space are beginning to fail me. The corvette class seems to my mind nearly properly met by the "Diamond" class, but the removal of the square rig would probably increase the steaming power and give the necessary coal supply. When we come to the smaller classes of ships we get out of the region of successful attack by rams, for they themselves would be rams of a handy size; and in a ramming combat the ram proper would not have greatly the advantage, hampered as she must be with armour to withstand heavy shot. So that in an encounter with a ram, which may be supposed to cost the same money as the corvette, the latter would fight fairly on an equality with the former, and so fulfil the rôle which I assume to be her's. The corvette—which I might call the "Venture"—would not use her guns against a ram proper, for that would be to throw away fire uselessly, but if anyone argues that she should have plate-piercing guns on purpose to meet such a ram, I ask, *cui bono*? Why should the ram not be met with her own weapons? Such a suggestion brings forward the wild controversy as to few heavy or many light guns. If the "Venture" were to have two or three heavy guns, say 9 or 12-ton, it is quite true that she might, with an odd shot, damage a "Ramshackle," but not an "Outrageous" or a "Blunder." But on the other hand, she must be beaten by a ship of her own class armed with twelve 64-pounders and two  $4\frac{1}{2}$ -ton guns; this is a matter not admitting of argument, and quite apparent to those who agree with my preliminary dicta. But besides this capacity to fight her own class, or rather ships of her own value, she must push back the torpedo as far as may



be ; and there is nothing but a multitude of penetrating guns which will make torpedo attack sufficiently risky to prevent it. It is the very absence of this preventive, which makes the monitor-class so tempting to the sneaking torpedoist. The corvette is even more open to these attacks than larger ships ; for her lighter draught of water will push her closer in during times of blockade. But let it be known that, as well as a good look out, and giant bull's-eyes to scan suspicious surroundings, she has a *numerous* artillery ready for instant service, and the light and cheap torpedo vessel will think once or twice before she hazards an attack. The corvette should also be armed with at least two mitrailleuses, whose office it would be to represent short range shrapnel. The Gatling is an admirable weapon of its kind, but it is not so suitable for naval purposes as it might be. I have seen a mitrailleuse by L. Christophe of Brussels, which appeared to me a much more serviceable weapon for ships and boats, inasmuch as it could either be fired in single shots like the Gatling, or in a volley of 31 shots at a time, like the original mitrailleuse. Anyone watching the fire of the Gatling from a ship or boat *in motion*, must be aware that a very small number of rifles, I think seven, will equal its effect, as pauses must be made, almost between every shot, to relay. But in the rapid approach of torpedo boats, successive volleys accurately directed, will be much more effective than the somewhat wild fire of the Gatling under such conditions. In the corvette, and all the smaller classes of ships, where space below water is so important for boiler power and coal stowage, I think I should introduce in their engines an old principle in a new way. When the screw was first introduced, multiplying gearing was employed because it was not known how to get the requisite number of revolutions out of the engines. The plan was given up, partly because of the difficulties of multiplying gearing, but chiefly because gearing was no longer necessary. But now, when the number of revolutions of the engine can be so greatly increased, it seems to me that we should utilise that capacity. If the piston of a given engine travels twice as fast as it did before, it is certain that a cylinder of half the size will do the work of the original engine, subject of course to certain losses. But as weight and space are the two difficulties in the design of a war ship, anything which diminishes them may be freely accepted so long as no more than diminution of weight and space is developed. In another matter connected with the smaller class of vessels, the sloops, I have arrived at very definite conclusions. Without a certain relative draught of water, these smaller vessels would not fulfil their places even in peace time, and for the operations of blockade or attack on enemy's ships in shoal water, would be more or less ineffective. I think the sloop class ought not to draw more than 10 feet when crossing bars, and operating in shoal water. But on the other hand, I think it is a great mistake to inflict on general service sea-going sloops, the disabilities which a light draught of water carries with it in the open sea. I think therefore that the shifting of weights for exceptional service should be distinctly contemplated in the sloop class, and I should fix on fresh water, shell, and shot, as the weights most capable of being dealt with in this way.

The transference of a single ton from 60 feet abaft the longitudinal centre of buoyancy to 60 feet before it, representing a moment of 120 foot-tons, would have considerable effect, and I suppose that in ships prepared for it, the weights represented by water, shot, and shell, would effect the object. Supposing the sloop to draw 8 feet forward, and 11 feet aft, on an even keel she would draw only 9 feet 6 inches; but even less than that, as the water would be started overboard. I should not, I think, willingly allow guns to form a part of this shifting weight, for the use of the guns must be contemplated in shoal water. But if the intended variation of draught could not be obtained in any other way, I should endeavour to move the after broadside guns to ports where they would be equally efficient forward.

56. I am only now concerned to describe with some more particularity a typical "sloop" such as I desire to see. Her draught of water and her coal supply are the great limiting conditions of the sloop; armament remaining at first somewhat in the background. Speed is mingled with coal supply, but I suppose the sloop ought to get 11 knots on the measured mile. The coal supply I have already fixed at 4,000 miles for five knots, and the shoal draft of water at not more than ten feet. The sloop's armament would be somewhat more composite than that of larger ships, for it has to be borne in mind that while she may be met in the open sea by her fellow, and must therefore be armed principally in view of that contingency, she will also want something of longer range and of heavier shell for reaching into shoaler water than she can advance to, as well as for those land attacks which form the naval basis of our little wars. Hence her armament ought to contain one, or at most, two large guns, pivoting amidships, while she, like the corvette, frigate, and fleet-ship, wants a numerous light armament for the same purposes. I have, as in the case of the "Ontrageous," taken a type from amongst our own ships, but it is not necessary to name her. She is about 600 tons, steams from 10 to 11 knots under favourable conditions at full speed, and can go about 2,000 miles in smooth water with her coal supply. She measures about 155 feet in length, and 25 feet in breadth, and draws when complete for sea, about 9 feet 6 inches, being a foot by the stern. Her armament consists of one  $6\frac{1}{2}$ -ton gun, one 64-pounder, and two 20-pounders, all mounted amidships as pivot-guns, the 20-pounders being at the bow and stern. The type is not unsuccessful, as these figures show, but her difficulties are that she is easily stopped in a sea-way, and cannot ensure making a full use of her normal steaming powers. Her spread of canvas (10,134 square feet of plain sail) of course assists her if she can use it, but she is naturally incapable of beating to windward, and her sail power costs her more than 20 tons of weight, that is, nearly one-third of her coal supply, and more than the weight of her guns. She is also short of boiler power, not perhaps for a short run, but she is short when speed is required for any continuance. Having but four guns in all, she is in a bad position to defend herself from those boat and torpedo attacks which her inshore position in time of war would call out, and lastly, she has, from my point of view, only half the coal that she ought to have. I pre-

pose to modify this type to meet all the requirements of my ideal ship, by adding to the size of this ship about 140 tons, making her displacement 732 tons; and I propose to do this by adding 15 feet to her length, and a proportionate beam and depth. This will give me space for four boilers similar to the three carried by my model; space also for 140 tons of coal, or double the quantity now carried, and a more roomy upper-deck for the armament. As to the draught of water, I propose to bring the "Bantam," as I name the new type, three feet by the stern; making 8 feet forward, and 11 feet aft. Then by stowing water (10 tons) and shot (say 5 tons) abaft, I should expect to get movable weights sufficient to bring the ship on an even keel, or 9 feet 6 inches mean draught for inshore operations; for the weights moved would not affect her fighting power, and hardly her steaming power in smooth water, while in the open sea her screws would be 1 foot 6 inches deeper than in the present type. As to weights, I should get about 15 tons by the modification of the rig, and about 75 tons by the additional buoyancy, after deducting weight of hull. This 90 tons will give me the boiler at 17 tons filled; and the coal 70 tons; leaving my weights for armament as at present in the type adverted to, or, with ammunition included, at 31 tons 11 cwt. in all. The armament I propose for this weight would be two 64-pounders at 14 tons 12 cwt. together, and six 20-pounders at 14 tons 2 cwt. in all, making 28 tons 14 cwt., and leaving three tons for Gatling, or mitrailleuse, to be mounted, one on the poop and one on the forecastle in a nest of hammocks, or a coil of hawsers in action. Those who lay stress on single heavy shells might wish to vary the armament by substituting a single  $4\frac{1}{2}$ -ton 7-inch gun for the two 64-pounders, but in my mind the other is preferable, and I should think that a "Bantam," armed as I propose, would have no difficulty in dealing with her older sister, armed as I have described. The exemplar would fire one 7-inch shell, one 64-pounder shell, and two 20-pound shells, as against the "Bantam's" two 64-pounder shells, three 20-pounder shells, and two Gatlings; but the exemplar would be in no condition to reply on her opposite broadside, whereas the "Bantam" would always have at least three 20-pounders to use, pending the transport of the others. But in repelling the attack of torpedo-boats, or boats attacking with intent to board, the "Bantam" would be immeasurably the superior of her exemplar, and the sloop should be armed with peculiar reference to attacks to which she is peculiarly liable. Plates IV and V give the outline of the "Bantam," on which it is unnecessary to do more than remark that though the sail power is apparently reduced from 10,134 square feet to 4,476 square feet, the reduction is not so great in reality, for circumstances render it unusual for my exemplar to set more than 7,812 square feet as "plain sail."

57. I must advert for a moment to the gun-boat and other special classes, before quitting this description of my ideal navy. I do not think that the gun-boat should be looked on as a sea-going ship. Draught of water is the be-all and end-all of the gun-boat, and it should not exceed 6 feet. At such a draught, sea-going qualities, coal

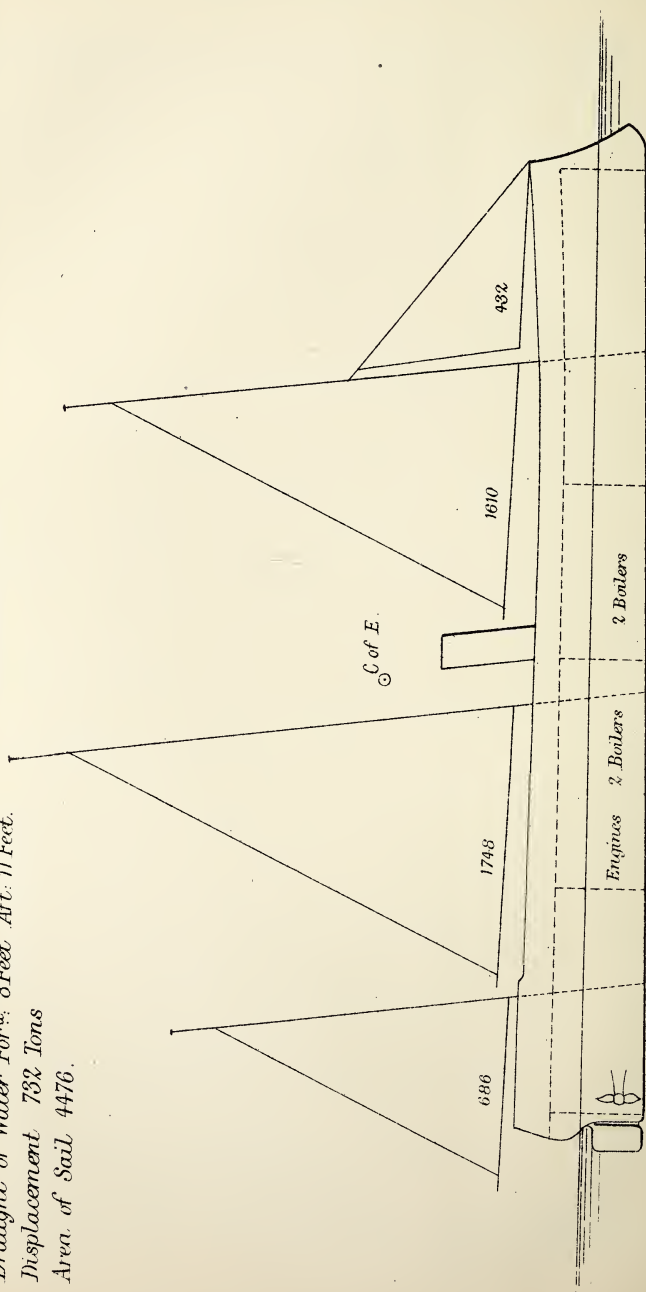




Length at Water Line 170 Feet.  
Breadth Extreme 27.3 Feet.  
Draught of Water For & 8 Feet. Aft: 11 Feet.  
Displacement 732 Tons  
Area of Sail 4476.

# H. M. S. "BANTAM"

Scale  $\frac{1}{4}$  ins. = 1 Foot.

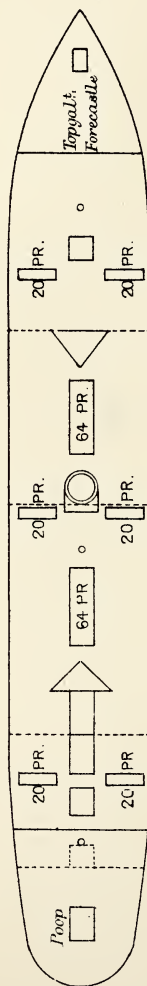




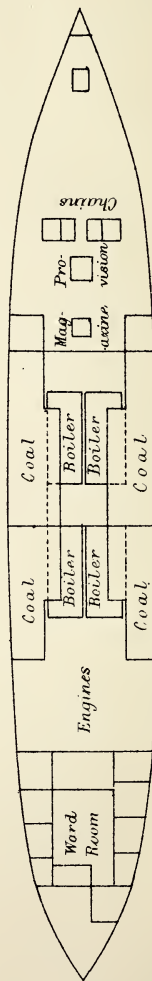
H.M.S. "BANTAM".

Scale  $\frac{1}{2}$  ins. = 1 Foot.

PLAN OF UPPER DECK



PLAN OF LOWER DECK &c.



capacity, &c., must not be looked for, and the attempt to find them is almost sure to terminate in ultimate deep draught, so that in the result we get an inferior sloop instead of a superior gun-boat. Gun-boats can be worked as tenders very effectually on most stations, and as their functions lie at the very extremities of our naval nerve filaments, they must not be expected to take their place elsewhere. Despatch vessels of great speed, and great coal capacity—able to steam their 4,000 miles at a high rate, are acknowledged necessities—but they are despatch carriers and nothing more, so must not be looked on or treated as fighting ships. I have already stated that I do not think it is the business of Great Britain to develop the torpedo attack except as a sea expedient, and I am conscious of yielding against my better judgment when I allow that for the satisfaction of home communities money may be spent on outrigger torpedo boats, and on rams—if they can be very cheaply turned out, whose office it shall be to lie at the great commercial ports at home, and in those of India and the larger colonies. I grudge every penny withdrawn from the sea-going fleet, for I know in that alone lies our safety, but I would yield a very small sum to the popular mistake.

58. I promised at the outset (paragraph 18), that I should found our war navy on our peace requirements, and having described a complete navy such as I think would meet our war purposes, I must now show that such a navy does not so greatly differ from that now existing, which merely wants the backbone of my central idea, to be brought into harmony with it. I have turned to the sea-going navy abroad on the 1st January, 1877, and I have classified the ships, as though the classes corresponded to those which I would adopt, looking to their tonnage and draught of water as my principal guides. As we stand at present there is little correspondence between these elements and the power of the ship, but there must be a very considerable correspondence between them and the *cost* of the ship, so that my classification is fair. I find then that we had abroad on the 1st January, 1877, excluding ships on passage out to relieve others:—13 fleet-ships; 12 frigates; 18 corvettes; 38 sloops; 16 gun-boats; and 8 despatch vessels. The fleet-ship varied in displacement from 10,275 to 6,010 tons; the frigate ranged from 5,152 to 3,060 tons; the corvette from 2,431 to 1,542 tons; the sloop from 1,108 to 529 tons; while the gun-boats varied from 455 to 330 tons. The draught of water of the fleet-ship varied from 27 feet to 23 feet; of the frigate from 24 feet 6 inches to 20 feet 2 inches; of the sloop from 14 feet to 8 feet 2 inches; and the gun-boat from 10 feet 5 inches to 8 feet 2 inches. It may be seen from this statement that not a great deal of change is asked for to complete the Navy in its symmetrical form, and that if a definite classification such as I propose were adopted, we should hardly have the anomalies which are now too often to be found. The variation of from 10,000 to 6,000 tons in the fleet ship is probably greater than we should find if a definite idea of the duties of fleet-ships as a class obtained. The frigate, again, is sometimes a small fleet-ship, and sometimes a large corvette. It is surely a waste somewhere if we find one sloop of 1,100 tons carrying only four guns, and



drawing 15 feet 8 inches of water, another of 950 tons and drawing 14 feet, but still carrying only four guns, while another carries nearly the same armament, displaces only 600 tons, and draws but 9 feet 6 inches of water. Then if the sloop of 600 tons draws but 9 feet 6 inches, surely the gun-boat of 450 tons should not draw so much as 10 feet 4 inches. But of all the 38 sloops scattered over the world, and on whom most of the burden of protecting our commercial routes must fall, I suppose there is hardly one which could steam 1,500 miles against a moderate breeze such as a trade wind or a monsoon, while the corvettes, frigates, and fleet-ships are only in rare instances in better case. My aim is that the ships should be more powerful as weapons, and should be able to transport themselves from point to point in a shorter time than at present, and when these two things are accomplished, I conceive it will be time to consider the economical question, which, or I am grossly mistaken, will be found to bear an answer in my favour.

59. The peace distribution of our present Navy gives a very perfect foundation for the organization and distribution of that which I propose in time of war. The fleet-ships which now form our Channel and Mediterranean squadrons, would, with augmentations, throw themselves upon the coasts of the enemy, and present outside each of his war ports, a force at least equal to his own. The failure of any blockading squadron to shut up its opponent in his own port must be communicated by the despatch vessel and the telegraph to the authority in command. This authority must bring up his supports, and the escaped squadron must be met at sea. So long as it is intact on the high seas, it breaks our communications in that direction, and commerce can only be re-established by its defeat. Lighter ships, frigates, corvettes, and sloops, would guard the inshore passages from war ports and prevent the exit of the enemy's "cruisers" to prey on our commerce; light ships of these classes would also watch the smaller ports where there were no fleet-ships, or perhaps any war ships of the enemy, but whence "Alabamas" might otherwise issue. Resting on Gibraltar, Lisbon, Madeira, and the Cape de Verdes, light squadrons and single ships would patrol the great southern trade routes, and keep them free of the enemy's wandering ships or squadrons; while St. John's, Bermuda, the Azores, and the home ports would equally furnish and sustain single light ships or light squadrons to guard the great western routes. These forces would be under single commanders, who would each be responsible for preserving the routes under his control intact. If any Mediterranean power were at war, or likely to be at war with us, then a proportion of fleet-ships must observe those ports where fleet-ships lay; otherwise, the route through the Mediterranean could be guarded by lighter ships resting on Gibraltar, Malta, and Port Saïd. Passing to the more distant but smaller commercial routes, the West Indies would be guarded by suitable light ships, of which the present West Indian squadron would form the nucleus. The present West Coast squadron would be the foundation of that force of light ships which would patrol between the Cape de Verdes, Sierra Leone, Ascension, St.

Helena, the Cape, and Natal. To the East India squadron would be appointed the routes from Aden to Penang in the east, to King George's Sound in the south-east, and to Mauritius in the south. The Red Sea, guarded at each end, would require no English force in it. To the present China squadron would fall the defence of the Straits of Malacca, of Singapore, and the routes north-east and south-east therefrom, while the Australian squadron would guard the coasts and routes as far east as Fiji. Passing back again, we find the beginning of a squadron in south-east America, which when strengthened, would rest, in the absence of alliances with Brazil and the South American States, on the Falkland Islands, Trinidad, and Fernando de Noronha. A strong section of this force would carefully watch the Straits of Magellan, and so guard the Pacific routes from western intruders. The Pacific itself would be guarded by the Pacific squadron, to be increased as much as necessary. Thus we see that really the instinct of the nation has prompted it everywhere to form a basis for the protection of its commercial routes in time of war, and it therefore only remains to continue to develop that instinct in proper directions.

60. I may now suppose a strong European coalition against us, and proceed to particularize more distinctly our position at the moment of the outbreak of war, supposing that it came without much warning. I assume that France, Russia, Germany, and Italy, are banded together against us, and propose to deal with that hypothetical and very remote contingency. France and Italy are Mediterranean powers, and the ports of Venice, Ancona, Castellamare, Spezzia, Genoa, and Toulon, would require squadrons of fleet-ships in observation and blockade. Russia could not enter the Mediterranean except by alliance with Turkey, or by forcing the way through our fleets to the Straits of Gibraltar. It may be said, perhaps, that Italy would have in her ports three first class and five second class ships, while France might have four first class and six or eight second class fleet-ships. Remembering that many of the second class ships, like our own "Warrior" and her contemporaries, are penetrable by the  $6\frac{1}{2}$ -ton gun, and that therefore a frigate such as the "Ram-shackle" would be an answer to them, we see that the force of fleet-ships in the Mediterranean necessary to confine these enemies in their own ports would not be impossible even now to collect. Perhaps sixteen fleet-ships and a proportion of frigates would be a sufficient guarantee for the safety of the Mediterranean commercial route; a force of corvettes and sloops remaining to patrol between Gibraltar, Malta, and Port Said. Now, in the Mediterranean, at the date I have chosen, we had six powerful fleet-ships and four frigates, besides one corvette, three sloops, and four gun-boats. If I use the term "ironclad," then I must say there were ten of them, many of whom would match ships of the enemy which I have counted as fleet-ships. But the displacement of these ten ships came to 62,854 tons, which divided amongst the proposed fleet-ships at an average of 7,000 tons each, would give nine efficient fleet-ships all practically impervious to anything under the 18-ton gun. An addition of seven fleet-ships

to the existing Mediterranean fleet might therefore be held to secure that sea, were the ships built and classed as I propose. If to this force were added a corvette, and three sloops, the highway could be guarded very efficiently, while a few frigates and corvettes would watch the ports, such as Venice, capable of fitting out "Alabamas," but incapable of despatching more powerful ships. Altogether, we may say the sixteen fleet-ships, six frigates, four corvettes, six sloops, four gun-boats, and two despatch-vessels, would almost guarantee the security of the great eastern route from Gibraltar to Aden; the addition to our existing force being seven fleet-ships, five frigates, and three sloops. Let us now proceed up the coast of Europe, where, passing by Spain as neutral, and Portugal as friendly, we come to France as an enemy, and to Roehfort as the first war port which we meet. Here, however, we cannot meet the fleet-ship, as there is not water for her, so that no ship larger than a frigate is needed to blockade the Charente. L'Orient is the next war port met with; but here again a heavy blockading force would not be necessary, as I gather that at high water spring-tides there is no more than 29 feet water at the entrance. The port could now hardly be used for the collection of first class fleet-ships. At Brest, however, we may expect to find at least an equal force to that which we found at Toulon, say twelve fleet-ships, to which must be opposed in observation twelve of our own. We find our Channel Squadron to consist of four fleet-ships at the date selected. There were besides in the Home ports as a reserve, or otherwise in commission, ironclads, or their representatives, to the number of ten; therefore we should be able to deal with the coast of France as far as Brest in the matter of fleet-ships, and yet have two to spare for Cherbourg, where we might also expect to find twelve fleet-ships. An addition so far of ten fleet-ships to any existing force in commission for the Channel, and of seven for the Mediterranean, would therefore be a reasonable requirement to protect our southern and eastern commercial routes from absolute breach by hostile fleets under the conditions named. We have next to deal with Wilhelmshavn, where we may assume one-half of the German Fleet to be assembled; say, three first class, and three second class fleet-ships, to be observed by six of our own fleet-ships. Entering the Baltic, we come to Kiel, where we suppose there are five German fleet-ships, calling for five of our own to observe them. Then we come to the Russian ports of Sveaborg and Cronstadt, with perhaps a single first class fleet-ship, and twelve second class of very inferior metal and plating. Possibly ten of our own fleet-ships would be sufficient for their observation. Upon the whole, therefore, we see that with a fleet of 62 fleet-ships, we could undertake the blockade of all the Italian, French, German, and Russian ports, whence foes worthy of their steel could be expected to issue. That is not so great a number, when we remember that we had at the time chosen for comparison, about 48 ironclads, at least as competent as those I have assumed to be arrayed against us. As to the numbers of frigates, corvettes, and sloops, which would be required to watch and blockade the smaller ports, I need not enter on so hopeless an estimate. I assume an imperfect blockade on this



head, and suppose that if there were any hopes of a successful attack on our commerce by frigates or smaller vessels, with reasonable hopes of safe return, such ships would find means to escape our guards. But the very root of my position is that a proper development of our existing resources will make it hopeless for anyone to attempt "Alabama" raids. So far we have got now as to show the forces necessary to obstruct the issue of hostile *fleets* against us, and to prevent their junction in so overwhelming a force that our patrols along the lines of commerce must abandon their duties. I have also shown how small a force may guard the Mediterranean route when once the heavy ships are blockaded. If four ships are known to be lying between Gibraltar and Malta, and four more between Malta and Port Said, she would be a sanguine "Alabama" who should hope for a successful career on that line. I may now turn to the more distant commercial routes and their protection.

61. I have said that the squadron in the East Indies would be charged with protecting the eastern routes from Aden to Penang, to King George's Sound, and to Mauritius. Now the forces of Italy, or of Germany, must reach this field of operations by running the gauntlet round the Cape of Good Hope; or Cape Horn; on their route they would meet, even now, the most tremendous difficulties. There lie in wait for them even in peace time, the West African Squadron of 9 sail, and the South American of 3 sail, while they could not easily obtain coal from neutral ports on a track so watched. France, however, has at Bourbon, Pondicherry, and at Saigon, ports of her own which must be watched, while Russia has her ports and existing squadron in the North Pacific. Russian Siberia and French Cochin China would be for the observation of the China squadron of which I shall presently treat. Bourbon and Pondicherry would each require the presence of perhaps a single ship, resting on Mauritius and Trincomalee. Looked at thus, it may be seen that a very small force is necessary in the East Indies to keep our trade routes inviolate; and the present force of 1 frigate, 4 corvettes, and 7 sloops, might be actually reduced when the graver policy of a European war supplanted those smaller matters which now keep up the East Indian squadron at its high standard. With such ships as I propose, which could throw themselves at very considerable speed on menaced points, a greater concentration at the Cape of Good Hope would be a reasonable way of protecting the East Indies. Singapore and the Straits of Malacca form so inviting a sluice valve to check the waters of our commerce, that we may almost be sure that a serious attempt to get hold of the handle would be made there, if anywhere in the East, by the powers I have named. It can be approached from so many directions, that the powers in consultation might very readily agree to make a junction of all forces there on a given day, each sending perhaps two or three times as many ships as are necessary, to make up for certain losses on the way. I think therefore that some concentration of our ships should be made there, and this brings me to the consideration of the China squadron and its duties. It consisted at the date named of 1 fleet ship, 3 corvettes,



15 sloops, 4 gunboats, and a despatch vessel. Here is really a very fine force if the sloops were as efficient in their powers of locomotion as I propose they should be. If a corvette and 3 sloops watched the chief Russian port in Siberia; if the fleet-ship watched an enemy's fleet-ship say at Saigon; if she were supported according to the force found there—say with 1 corvette and 2 sloops; and if 4 sloops were left along the route from Hong Kong to Japan, we should still have 1 corvette, 6 sloops, and 4 gun-boats to protect the route from Singapore to Hong Kong, and to guard Singapore itself. It is not probable—if only the ships were as I wish them—that any addition to the peace establishment in China would be necessary in war time; for, as in India, the smaller local wants of peace must immediately give way to the exigencies of an Imperial policy in war. In Australia we should probably want an addition to the 3 corvettes and 1 sloop which now represent our naval forces there, and I think that if we took that of the 4 frigates of the detached squadron which existed at the date named by me, and placed them under the command of the Australian Admiral, together with two or three sloops, Australia would be left reasonably secure. The Pacific trade route is perhaps the most difficult of all to guard, and I think it very probable that much would have to be done by way of convoy. The route is liable to attack from the bases of Siberia by the Russians, and of Tahiti by the French, and it is difficult to see how the successful raids of *sailing* “*Alabamas*” on a *sailing* trade are to be prevented, the means of concealment and escape being so complex in so great an expanse of ocean. Convoy for the sailing trade would therefore appear to be a necessity, and the probability is that the traffic across the isthmus would be increased, while that round Cape Horn would be diminished. The Siberian fleet being thoroughly blockaded; and Tahiti, the Marquesas, and New Caledonia thoroughly denuded of possible “*Alabamas*,” the Pacific trade would only be open to the attack of “*Alabamas*” fitted out in the neutral ports of Pacific America. It would be dangerous for the smaller States to permit such proceedings, while America might be relied on—in view of her own “*Alabama* “*Claims*”—to take care that nothing touched us from a United States port. But the existing Pacific squadron of 1 fleet ship, 2 corvettes, and 5 sloops would be properly augmented by at least a corvette and 3 sloops in a war with European powers. Returning home again we pass to the Falkland Islands, on which the present force of 1 frigate and 2 sloops would, when augmented, rest in time of war. This force would be in some degree united with that on the West Coast of Africa, now amounting to 1 frigate, 2 corvettes, 1 sloop, and 5 gun-boats; and I think it would be well, seeing the value of the two great commercial lines which pass there, to unite the two squadrons as a South Atlantic naval station. Even in peace the South Atlantic squadron of 2 frigates, 3 corvettes, 3 sloops, and 5 gun-boats is respectable, and if called in upon Ascension, St. Helena, and the Cape, would show a very fair guard there. But a concentration would probably be required at Ascension, as at the Cape and the Falkland Islands, as these three points form as it were the necks of the

navigation, and if sufficiently guarded, expeditions for more distant parts of our empire might there receive a check. The West Indian and North American station is now provided with 1 fleet-ship, 1 frigate, 3 corvettes, 4 sloops, and 3 gunboats, and these with augmentations would rest upon St. John's, Bermuda, Nassau, and Barbados, to receive the streams of commerce flowing east and west, and to purify those routes from the incumbrance of chance "Alabamas." New squadrons not now in existence would be required to guard the routes nearer home, but it would be found that they would be best disposed in a line running from Cape Finisterre to Cape Clear, and resting chiefly on the home ports. A chain of a dozen corvettes and sloops lying along that line would make a very efficient curtain to strain out the gnats which might wish to feed beyond that line on forbidden fruit.

62. I think that this cursory survey of our existing position in peace, and of our probable position in a war with four great maritime powers combined against us, is very reassuring in some respects; in others very much the reverse. If we took our present peace displacement of ships in commission, and their armaments, we should be very well satisfied; but if we look at their powers of locomotion we ought to fear. To have a force, and yet to be unable to employ it in the right place at the right time, is the ultimate blunder of bad generalship. That we should go on deliberately constructing naval forces with this flaw in them would very much surprise the ignorant. It is no surprise to those who recognize the force of the past in influencing the present. It will still be years before the great change I propose is made complete, but there is no year passes which does not more closely approach it, and if war does not come in the meantime, we shall not so greatly suffer. With ships designed as I propose they should be, our peace establishment ought to show such a front as will give us a secure basis against any possible combination in war.

63. I should add a word or two here on the fourth division of my subject, having treated of the first and second—I mean "Colonial" and "Home Defence." In the whole of my scheme I have assumed the security of the coaling stations, and I conceive that if a sufficient naval force is afloat to protect the line of communication between each pair of coaling stations, that act will protect the stations themselves. I find myself unwilling to withdraw from the fixed fund which I assume to be at our disposal, any part for the exclusive use of the coaling station, which might be employed to augment the sea-going fleet. But to be reasonable, I must admit the possibility of attack on a naval station in spite of its sea-going guard. I am only concerned then to meet this possibility in the cheapest way possible. And I think this way involves the following principles. (1.) Coal and other stores protected from shell-fire on the sea side. (2.) A garrison of sufficient strength to meet the ordinary landing parties of one or two frigates. (3.) Cover for that garrison. (4.) Stationary torpedoes where capable of application. (5.) Locomotive torpedoes either of the outrigger, or fish description. I should expect to get

news beforehand of any serious expedition against a naval station, and with ships capable of steaming at a moderate speed for a long time, I should always calculate on their assembly to defeat such an expedition. I should only give such a defence to the naval station itself, as would make its attack either useless or hazardous to anything short of a serious expedition. But I put much faith in the sea-going fleet resting on the naval station as a protective force, and little faith on any other appliance. The larger colonies are and must be in the hands of armies. The smaller colonies exist as the supports of a navy as an Imperial instrument. The larger ones and India exist as integral parts of the Empire itself. The first become parts of the Navy, and should in my opinion be entirely under naval control. The second can be attacked only after the failure of the Navy and must then be defended by an Army. Colonial and Home ports which are open to attack as a means of directly damaging the Empire, should be guarded by the Navy in sufficient force, while those naval stations which will be attacked as a means of indirectly damaging the Empire through the Navy, the Navy is doubly bound to protect. But as I have already said, I should allow to all ports open to attack, a certain sum to be expended in the cheapest defences, which appear to be the different classes of torpedo. I wish to condemn again with steady design the idea of the "Harbour Defence Ship." Such vessels are every whit as likely to be withdrawn as the sea-going ship when they are wanted, and the only result is that you build a bad sea-going ship when, had you never heard of harbour defence, you would have built a good one. The very extreme to which I would allow myself to go, would be in the ram and the "Gamma;" but these weapons, if prepared at all, would be for the great-home, or the great colonial, ports.

64. My task, which has been but badly and hurriedly performed, will now be done when I have said a word about the Naval Volunteer Force; but when I have thrown local Home and Colonial defence entirely on the torpedo, I have already made the supplemental force a corps of Volunteer Torpedo Men. I think it was always difficult to say what the functions of a Naval Volunteer force should be, so long as it was thought that they must serve on board ship. But now, if they are the defenders of great ports by torpedoes, we have for them a function such as their educational status will eminently fit them for, and an exercise for their skill and daring in time of war, which might be the envy of the highest genius. I am strong on spending little on harbour defence, and I therefore recognize in the Naval Volunteers that very element which I seek, and if the enemy is to be kept at bay by a home defence of any kind, I should think that a cordon of coast torpedoes, fixed and locomotive, in the hands of a British Volunteer force, will do it.

65. I have now concluded my essay, and as a final paragraph may summarise my views in a series of theses which may form the bases of discussion should I be so fortunate as to see my essay amongst those selected for publication. The theses are these :—

- (1.) A frank reliance should be placed on steam power; and coal in naval depôts.

- (2.) A classification of our ships should be adopted, and the types should be reduced in number.
- (3.) It is an error to suppose that the disappearance of armour is approaching, and equally an error to suppose that guns of 80 tons and upwards are the weapons of the future.
- (4.) No nature of torpedo will greatly alter the tactics of a modern sea fight.
- (5.) It is possible to subordinate the requirements of a peace establishment to those certainly required in war, not only without an increase in the Estimates, but with a possible reduction.
- (6.) Coast and harbour defence should occupy in the British Empire an entirely subordinate position, and the best defence of naval stations is the defence of the routes communicating with them.



## LECTURE.

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Friday, February 1, 1878.

W. STIRLING LACON, Esq., Vice-President, in the Chair.

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### ON SOME OF THE MAIN CAUSES WHICH LEAD TO THE FOUNDERING OF SHIPS.

By Vice-Admiral E. GARDINER FISHBOURNE, C.B.

SHOCKED by the report that thousands of lives were annually lost at sea, I examined the "Wreck Register," and found that this was so true as to make it incumbent upon every sailor to seek a remedy.

There ever will be wrecks arising from carelessness, ignorance, fogs, changes in currents, collisions, and unexpected gales, but these are beside my object now, though the losses on these accounts with care might be largely reduced.

Striking facts point to radical defects.

In 1874, of casualties at home, 338 happened to nearly new ships, 646 to ships of from three to seven years of age, 961 to ships of from seven to fourteen years of age. Rottenness can have no part of the blame here! In the same year casualties occurred when the wind was such that a ship could carry top-gallant sails, 656 when the force of the wind was only such that a ship ought to be able to hold on her way, and only 952 with the wind at and above a strong gale.

We must, therefore, seek some other causes than stress of weather, rottenness, great age, or weakness to account for the great proportion of the losses of life and property.

These, in the main, will be found to be insufficient stability, in which other defects are involved, as unsteadiness, limited power of the helm, and improper stowage, taken in its widest sense.

Some will say, how can these affect old and rotten ships? I answer, such may be doomed; give them little stability, and stow them badly, and their doom will be accelerated; the contrary will prolong their lives and afford the crews greater chances of escape.

Every ship is necessarily subject to wear and tear; distribute their weights badly, and they will carry in them an accelerating force of disintegration; out of the best weather they will make bad, and of bad worse, without any profit to compensate.

A rotten ship may be safe to reach little further than outside the port, then go down; this equally occurs to good ships from deficient stability, as for instance, to the "Stuart Hahnemänn," a new merchant ship of 2,500 tons, to the "Tacna," a steam vessel, and to the "Captain," of the Royal Navy; the "Invincible," not without reason, was thought to have been in like danger.

It is equally distressing and injurious to public interests whether the loss of life and property arises from the bottoms falling out, or from the vessels capsizing.

Hundreds of vessels leave our ports said to be seaworthy, yet are not so; some of these for a time make voyages safely, the time comes when they fail; this need not be.

It is clear from the testimony given after losses, that captains are often forced to ignore their own true experience, and accept opinions said, without reason, to be scientific.

No such obligations should be forced on them, nor would they, were it understood that the interests of the ship-owner, of the underwriter, and of the crew are inseparable, and that experience is more to be trusted than any theories.

Before commencing this paper, it will be necessary to review of that by Mr. White, read in this Institution,<sup>1</sup> as he takes an opposite view; indeed I am obliged to go to the Navy for data. He says "that considerable anxiety was felt, and expressed in many quarters, as to the *safety* of ships burdened with great weights of armour; and it was generally assumed that they must roll heavily. These opinions were not shared by the designers of the ships, &c. The French led the way, our own Channel Squadron trials soon followed, and it was speedily shown that the popular belief was not well founded, all or nearly all of the ironclads proving at least as steady as the screw line-of-battle ships."

This opinion is contrary to facts and to admitted principles, Mr. White and his coadjutors being witnesses. Admiral Paris says of the French ships, "the new broadside ironclads are *worse rollers* than the old vessels used to be, and even in moderate seas bring their guns under the waves."

Mr. White recommends a reduction of the stability in order to reduce the arcs rolled through, or as Mr. Froude expresses it, so that the largest waves would fail to roll them. Mr. White says, "the reduction of stability or stiffness was made *advisedly*, in order to increase steadiness. The French designers have followed a similar course. Their latest completed ironclads, the 'Océan' class, have no greater stiffness than our 'Vanguard' class had before they were ballasted."

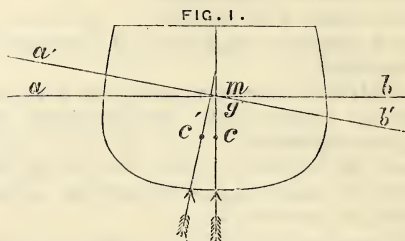
Truth is said to lie at the bottom of a well, so deep as respects this modern theory of rolling, that it is difficult to reach.

<sup>1</sup> See Journal, Vol. xxi, No. 92, page 933, *et seq.*

The "Vanguard" was not deemed to be seaworthy, till her stability was increased by 340 tons, when this has been necessary for the "Océan" class there will be a parallelism—not before.

Meta-centric height is no measure when the ships are so entirely different as *these* are.

The meta-centric height is the distance of the point of intersection of two lines of support, above the centre of gravity, *i.e.*, a line when the vessel is upright, another when inclined. See Fig. 1.



*ab*, water-line when upright. *a'b'*, water-line when inclined. *c*, centre of displacement. *c'*, centre of displacement when inclined. *m*, the meta-centre. *g*, centre of gravity. *mg*, meta-centric height.

Though Mr. White recommends raising the centre of gravity and distributing the weights to the sides, in order to reduce the arc rolled through, there is no instance on record,—nor could there be,—if mechanical principles are true, where that has been done, all other things being left unchanged, whatever the size or form of the ship, that she has not rolled through all the larger arcs.

Sailors know full well that running guns in from the sides and lowering all the top weights in bad weather, have always contributed to the ease, often to the safety of ships, as they then rolled through smaller arcs—wooden ships soon let you know this by the relief given to their *creaking bones*. The only apparent exception proves the law, that is, where the weight is too low and too centralised, then the rolling is too quick, short, and jerky for masts and fabric.

There is no warrant for the assertion that old ships rolled more than the armoured ships, still less that there is any truth in this new theory.

The "Albion" peg-top rolled more than any other, she rolled only 47°. But Mr. White informs us that "Lord Warden" rolled 62°.

Mr. White gives a theory of wave-motion and supposes a tiny raft to take the place of a surface particle, yet does not affirm that the raft passes through the gyrations common to this particle—only that it is generally influenced by these motions. He asserts, however, that an observer standing on this raft would be so influenced by its motions that to him the mast in it would appear to keep truly vertical, and the raft to remain perfectly steady, while it might be rolling through an arc of say 15° or 20° once every four or five seconds—not, however,

offering any proof of this, still less any proof that a ship that substitutes in space millions upon millions of these particles can by any means follow the gyrations, or be sensibly influenced uniformly by one or more of them, moving with velocities enormously different, many of them moving in opposite directions.

Were it so, the rolling motions of ships would not tend to disintegrate their structures, nor would their masts ever be rolled away, but we all know the case is otherwise.

Mr. White seems not himself satisfied with his assertion, for he says "no ship exactly fulfils the condition of the *assumed* raft—happily it is so—neither could any such raft do so, particularly when it has parts *above water*, which make a radical difference in the whole problem."

Yet this is the smallest defect as far as any argument reaches, for in this theory there are but two forces alluded to—gravity of the particles and the centrifugal force. Yet the buoyant force exists and the particles roll on each other, for the gravity of the adjacent water produces buoyancy; but why is it omitted here? and the greatness of the pressure on the particles low down is shown in their almost motionless condition, a fact overlooked in this theory. In a word, the theory does not fit the facts.

If a person standing on the suppositious raft could consider the raft to be still, when rolling  $15^\circ$  each way every four or five seconds, it could only be by the centrifugal and centripetal forces balancing each other, as in the case of the earth; and if so, then a gun on its carriage and shot if unsecured, would not roll to the lower side during such rolling; nor, indeed, would a pendulum indicate any angular motion. If any one has had such an experience they may believe it, but they will say they would not have believed it had they not seen it, and will allow us the same liberty; we need not pursue this further till proof is offered.

We pass to consider Mr. White's table. He says, "reduction in stiffness lengthens the period, increase in the moments of inertia has the same effect; general experience confirms the teachings of theory, that on the whole the ships with the largest still-water periods are the steadiest in a seaway; out of the many cases on record, take the following"—

TABLE I.

Squadron of 1871.	Approximate still-water periods.	Mean arcs of oscillation.
	Seconds.	Degrees.
"Lord Warden" .....	5 to $5\frac{1}{2}$	62
"Caledonia" .....		57
"Defence" .....		49
"Prince Consort" .....		46
"Northumberland" .....	7 to $7\frac{1}{2}$	38
"Minotaur" .....		35
"Hercules" .....	8	25



French Expeditionary Squadron, 1863.	Approximate still-water period.	Arcs of oscillation.
	Seconds.	Degrees.
"Normandie" .....	5 to 5½	43·6
"Invincible" .....		41·4
"Couronne" .....	6	37·7
"Magenta" .....	7 to 7½	36
"Solferino" .....		35
Detached Squadron of 1875.	Approximate still-water period.	Arcs of oscillation.
	Seconds.	Degrees.
"Newcastle" .....	5	29·6
"Topaze" .....		22·6
"Immortalité" .....		20
"Narcissus" .....		19·6
"Doris" .....	8	18·7
"Raleigh" .....		5·8

The only data given in this table are the period and the arc of roll, and as *they* are given to prove the value of less stiffness and greater moments of inertia, we understand that it is implied that these are the sole causes of the differences in angular motion.

We are not told which of, or whether both of the opposite theories above mentioned, are supposed to be illustrated by the tests here recorded. The fact being that neither the theory nor the opposing law above mentioned are herein illustrated, for the greater or less angles of roll of these ships have no relation to periods greater or less, nor are the two elements alluded to, the main causes of the greater or less arcs. To the extent to which they operate, they are opposed to Mr. White's theory.

Before proceeding further we must repeat that Mr. White, by the word "steadiest," means the ship which rolls through the shortest arcs, and he gives these ships with their corresponding arcs and periods in proof.

But this is the opposite of that above stated, that "as the stiffness is reduced and the moments of inertia increased, the periodic time is increased and with it the arc of roll." The Scientific Committee on Designs say, "as the angle of roll increases, the periodic time increases." Equally as the periodic time increases, the angle of roll increases—or to put it in other words—as stiffness is reduced by raising the centre of gravity, and increasing the moments of inertia, the periodic time and angle of roll are both increased, and the ship made more *unsteady*!

Now, the new theory is, that as the stiffness is reduced and the moments of inertia increased, so the ship is made more *steady*, or rolls through smaller arcs; we shall see! Yet, taking each table by itself, it does not illustrate the law of the pendulum, but flatly contradicts it; for the shortest arcs are opposite the longest periods!

Establishing that, there are elements in the problem that these tables refer to, more influential than moments of inertia or meta-centric height, and to which are due the apparent anomaly.

Why Mr. White should give this table as illustrating that raising the centre of gravity reduces the arcs rolled through, I do not understand, since he has not given the meta-centric height, which is indispensable evidence; still less can I understand how it proves that increasing the moments of inertia reduces the arcs rolled through, and makes ships steadier, for it shows that the unarmoured ships of small moments of inertia are by far the easiest. As to ironclads, he leaves us without any knowledge of their weights of armour or breadth of beam, though they are indispensable for even a rude estimate of their moments of inertia.

Again we ask, is it reasonable to build a great theory upon the results of one experiment? I give the contents of other tables, such as I possess, to show how little confidence can be placed in one series.

TABLE II.

*At Anchor, Armoured Ships rolling.<sup>1</sup>*

"Northumberland" .....	28
"Monarch" .....	26
"Prince Consort" .....	13
"Defence" .....	15
"Caledonia" .....	13

*At Sea, immediately after.*

"Lord Warden" .....	36
"Caledonia" .....	50
"Topaze" .....	13
"Rapid" .....	20

Here all the easiest ships have the dangerous 5 seconds' period, while the "Northumberland" and "Monarch," of  $7\frac{1}{2}$  seconds' period, stand only fifth and sixth!

TABLE III.—June 2nd.—Squadron under Sir Thomas Symonds.

	Roll per minute.	Mean Roll.	Maximum Inclination.	Period.
"Minotaur" .....	8	5.2	5.5	$7\frac{1}{2}'$
"Agincourt" .....	7.8	8.6	7.5	$7\frac{1}{2}$
"Northumberland" ....	4	6.5	7	$7\frac{1}{2}$
"Hercules" .....	9	2	4.5	$6\frac{2}{3}$
"Monarch" .....	6	4	5	10
"Inconstant" .....	6	2.5	4	10
"Warrior" .....	8	10.5	16	$7\frac{1}{2}$
"Volage" .....	6	11	14	10
"Captain" .....	7	3.6	3.7	$8\frac{1}{2}$

This table contradicts Mr. White's, as did the former, as to the ease of "Hercules," her period and stability, therefore his arguments also. If this is true, the "Hercules" has a shorter period and more stability than he assigns to her. I am disposed to think it is so. She ought, according to his theory, to roll more than this table gives her.

The equal length of period in the case of "Monarch," "Inconstant,"

<sup>1</sup> All armoured.

and "Volage," if this is so influential a factor as he affirms, ought to have produced an equal mean roll, if not also an equal angle of mean inclination; but the truth is, meta-centric height is not, nor can be, an influential factor, in the direction in which Mr. White argues. But let us proceed on the assumption that Mr. White's table is accurate, and ascertain what it says.

1st. That the arcs of roll of English armoured ships vary from  $62^{\circ}$  to  $25^{\circ}$ .

2nd. That the arcs of roll of French armoured ships vary only from  $43^{\circ}$  to  $35^{\circ}$ .

3rd. But the English *unarmoured* ships vary from  $29^{\circ}$  to  $6^{\circ}$ .

Yet this states only half the truth, as respects the *unarmoured* ships, for they are all from 1,000 tons to 5,000 tons less than the armoured ships! No doubt all these ships were not tried together, but the "Topaze" *was* tried with each squadron, and she rolled only  $22^{\circ}$ , when the best of the ironclads rolled  $25^{\circ}$ , and in this table she is credited with  $22^{\circ} 6'$ . So then it is not a "*popular fallacy*" that armoured ships roll more than *unarmoured*.

But surely, the table gives the ships in the order of their meta-centric heights, agreeing with their angles of roll? By no means. The meta-centric heights of the French ships are all much greater than those of the steadiest of the English ships with long periods, and yet they are all steadier than most and nearly as steady as any but one of the English ironclads, notwithstanding that they are all much smaller, the best French ship being nearly 2,000 tons less than the best English, and 3,700 tons less than the largest; the worst French ship is 3,000 tons smaller than the best English, whose period is given as 8 seconds, while that of the French ship is only 5 seconds!

Here, again, we fail to find any law such as Mr. White would have us believe in, but quite the contrary, for, let me add, that the Admiralty report states that all the French ships were under more unfavourable circumstances than the English ships, the former having had a "heavy beam-swell" to contend against!

As Mr. White's object was to enable us to form a correct judgment upon an important national subject, we ask why he withheld from us all that was indispensable for enabling us to come to a *just* judgment?

Why strike out from the table he gave us the "Topaze?" He may say, of course, "I did so because she is not an ironclad," but he had spoken disparagingly of the unarmoured ships as compared with the armoured, therefore he should have allowed us to see what place she really took. Why omit also the French *unarmoured* ships "Tourville" and "Napoleon," and the English "Edgar," if it were not that he was a special pleader for Admiralty ironclads? These were his opponents' witnesses. But why omit the English "Achilles" and "Black Prince?" which were *armoured*, and therefore ought not to have been shunted, if the whole truth was to be told. Let me bring them before you that you, Gentlemen, may hear what they say. Let us first see what further is to be obtained, as to law, from the table as it stands.

Mr. White seems to imply that there is a mysterious connection



between periodic times and angles of roll that indicates a law in connection with reducing the stiffness and increasing the moments of inertia. Yet the differences of roll for half a second of period are—

The 1st table from 5 to $5\frac{1}{2}$ seconds .....	16	degrees angle of roll.
„ from 7 to $7\frac{1}{2}$ „ .....	3	„ „
„ from $7\frac{1}{2}$ to 8 „ .....	10	„ „
The 2nd table from 5 to $5\frac{1}{2}$ „ .....	2	„ „
„ from $5\frac{1}{2}$ to 6 „ .....	3.7	„ „
„ from 6 to $7\frac{1}{2}$ , but $\frac{1}{2}$ second..	0.9	„ „
The 3rd table. No difference of period....	11	„ „
<hr/>		
From 5 to 8 seconds max.	23	„ „
From to „ min.	12	„ „

Nor is this all, for the best ironclad, the “Hercules,” under somewhat different circumstances, rolled  $20^\circ$  more than the unarmoured “Raleigh,” though the latter was 3,000 tons smaller, and was without the alleged soporific! taking the “Topaze” as the standard! Against “Hercules” she rolled  $22^\circ$ , against “Raleigh” she rolled  $22.6^\circ$ .

It is clear, from first to last, that there is no evidence of law, and, if anything is illustrated, it is the opposite of the law, as propounded by Mr. White, and the opposite of Mr. Froude’s theory, alike demonstrating that there are elements in the problem vastly more influential than meta-centric height or moments of inertia, and that the former and neither of the latter are the causes of the differences observed.

I must now beg your attentive consideration to the contrast I shall show you by the table, as it originally stood, containing the “Topaze,” placing the ships in the order of their rolling, together with other information indispensable for a true judgment, which ought to have been given previously.

TABLE IV.—*The Squadron of 1871.*

	Displacement.	Meta-centric height.	Angle of roll.	Weight of armour.	Length.	Breadth.	Period.
	Tons.			Tons.	Feet.	Ft. in.	
“Lord Warden” <sup>1</sup> ..	7,344	4.6	62	1,379	280	59	} 5 to $5\frac{1}{2}$
“Caledonia” .....	6,832	6	57	930	273	59	
“Defence” .....	6,070	..	49	607	280	54	
“Prince Consort” ..	6,600	6	46	941	273	59	
“Northumberland” ..	10,584	3.8	38	1,547	400	$59\frac{3}{4}$	} 7 to $7\frac{1}{2}$
“Minotaur” .....	10,234	3.8	35	1,776	400	$59\frac{4}{4}$	
“Hercules” .....	8,677	3	25	1,481	325	50	
“Topaze” .....	3,915	..	22	None	..	..	8 5

<sup>1</sup> The large amount of armour on “Lord Warden” would lower meta-centric height, as compared with “Caledonia” and “Prince Consort.” She has 430 tons more armour than “Caledonia,” which would raise her centre of gravity, lower her meta-centre, and reduce her meta-centric height!



Mr. White gave his table as demonstrating that weights on the sides and small meta-centric heights tend to make ships easy, and that armoured ships do not roll as heavily as unarmoured ships, and that it was a "popular fallacy" to think otherwise.

First, then, we have the unarmoured ship "Topaze" easier than the best ironclad, *though 4,700 tons smaller!* of a worse form for ease, no weights on her sides, and having a much *greater* meta-centric height, with a period of only *five* seconds, while the "Hercules" has an *eight* second period.

When this experiment was reported in the *Times*, it was stated, in a letter by Mr. E. J. Reed, which also appeared in that paper, that the reason why the "Topaze" rolled so much less than her majestic comrades was because her masts were much larger in proportion than theirs. Now, any one ordinarily acquainted with Mechanics knows that the increased momentum of these greater masts would carry her through larger arcs, and that, had she had smaller, she would have rolled faster, but through smaller arcs. But this is contrary to the theory that increased moments of inertia tend to make vessels more easy, which the writer was *then* contending for.

2nd. The "Lord Warden" is the most uneasy, more so than three smaller ships, being 7 feet longer than two, 500 tons larger than one, 700 tons larger than a second, and 1,200 tons larger than the third; in addition, she has, according to the new theory, a greater soporific in the shape of 450 tons more armour than two of these, and 770 tons more than the third; she has also a less meta-centric height than two of these, and *this is one cause of her inferiority!*

The "Defence" is made by this table to be more uneasy than the "Prince Consort," but Sir Spencer Robinson places the "Defence" first, no doubt correctly, as her length is greater, her breadth less, and weight of armour less.

There is little difference between "Northumberland" and "Minotaur," sister ships; what there is, is against the new theory, the more uneasy ship has 230 tons less armour, although she is 350 tons larger, and therefore ought to be easier according to *it*. As to the reason why the "Hercules" should be better than these two last, there is too little to show, except that she has a better section, if it be true that she is better? I say so, for Table III shows her period to have been  $6\frac{2}{3}$  rather than 8, as given here, and rolling faster than "Agincourt," an easy sister ship of the two above-mentioned.

We need not analyze the table of French ironclads, except to state that they roll in the order of *size*, and that their *great meta-centric* heights are in favour of their *limited arcs* of roll, as compared with the English ironclads.

The maximum difference of roll between the best and worst English ironclads is  $37^\circ$ ; the difference of meta-centric height being only  $1\frac{1}{2}$  feet! while the maximum difference of roll in the French ships is only  $8\frac{1}{2}^\circ$ ! yet the difference of meta-centric height is 2 feet! The French ships are of the same type; the English ironclads differ essentially in many particulars, vastly more than they do in their meta-centric heights!

As to the English unarmoured ships, I have not their meta-centric heights or other general data necessary to enable me to say more than that the one ship which stands in the table as superior, is of an entirely different type from all the others, having much greater length and much greater proportionate length to breadth, which latter is the disturbing element, and she is more than 1,000 tons, or one-fourth, larger than the most uneasy; but I have no confidence in the record of "Raleigh's" rolling, as like causes produce like results, and her ordinary performances will be rather like those of "Inconstant" or "Volage," allowing for the difference of size. We shall see somewhat of the "Volage's" performances further on. We shall now give a table of the ships reported on by Sir Spencer Robinson, in the order placed by him, with additional data.<sup>1</sup>

TABLE V.

Name.	Displacement.	Height of meta-centric.	Length.	Breadth.
	Tons.	Feet.	Feet.	Ft. in.
"Solferino," French, armoured .....	6,700	4·5	290	56 8
"Tourville," " none .....	5,680	5·3	240	55
"Napoleon," <sup>1</sup> " " .....	5,080	4·9	233	55
"Achilles," <sup>1</sup> English, armoured .....	9,694	3·1	380	58 3½
"Magenta," French, " .....	6,700	5·0	290	56 8
"Edgar," <sup>2</sup> English, none .....	5,700	4·6	240	58
"Black Prince," <sup>2</sup> English, armoured .....	9,137	3·2	380	58 4¾
"Couronne," French, " .....	6,000	5·4	270	54 9
"Invincible," " " .....	5,600	6·4	262	55 9
"Normandie," " " .....	5,600	6·5	262	55 9

<sup>1</sup> Equal.<sup>2</sup> Equal.

1st. The two French unarmoured ships are better than all the other ships except one, the "Solferino." She is 1,000 tons larger than one of these, 1,400 tons larger than the other, has 50 feet more length than one, and 57 feet more length than the other, with only a little more of the disturbing element—breadth. But the following is reported officially of "Solferino:"—"As to angles of oscillation, she has so *much less advantage as the sea was heavier.*" This necessarily would be the case from the increased momentum of her armoured sides.

I may mention that, on one occasion, she rolled 5·8°, while the "Invincible" (French), rolled only 3·6°.

The "Edgar" is inferior because she has 3 feet *more* beam than the vessels of her own size; her meta-centric height is *less* than theirs also.

The "Black Prince" is only equal to the "Edgar," though 3,500 tons larger, and 140 feet longer, with the same breadth, and inferior to four other ships, the displacements of which are from 2,400 tons to 3,500

<sup>1</sup> Single observations are influenced by foregone conclusions, and incidental errors should be eliminated by multiplied observations. Mr. Johns, N.A., frankly told us that for a long time he could not believe that the ship he spoke of rolled 45°, and that he was still puzzled about her.

tons less. Now, how can we account for this? There is nothing in the table to show, but that she has a *less* meta-centric height, which tends to increase the arcs of roll, and the weight of armour, as compared with the unarmoured ships, which has a like effect.

The "Achilles" takes a better place than the "Black Prince," though of the same main dimensions; but the latter has 500 tons less displacement, and not so good a form below; difference of meta-centric height is inappreciable. The only thing left to account for the inferiority of "Achilles" to "Solferino," "Tourville," and "Napoleon," though she has 90 feet greater length than the first, 140 feet greater than the second, and 147 feet greater than the third, is that of her *smaller* meta-centric height, and of her *weight of armour*, as compared with none on the "Tourville" and "Napoleon."

The small size of the three remaining French ships and their armour sufficiently accounts for their inferiority, without assuming a violation of law, that it is because of their greater meta-centric heights. The "Napoleon" and "Tourville" are of a better form, besides being without armour. The "Couronne" is better than the other two, to the extent only of 3° of roll; against this, we set off her greater size, 8 feet longer and 1 foot less beam, the disturbing element.

The "Lord Warden," the worst roller amongst English ships, rolled 19° more than the worst French ship, though the former was 1,700 tons larger. This may be accounted for in part by the fact that the French ship had a greater meta-centric height by 1·9 feet.

Thus we see that the only conclusion to be drawn from the facts, figures, and opinions of Mr. White's own department are entirely against the idea that raising the centre of gravity to reduce the meta-centric height, and increasing the moments of inertia by weighting the sides, decrease the arcs of roll.

The above illustrations show that *instability*, *not* stability, is the cause of rolling motions. I must now show that this is in accord with received principles.

It is taught that "the effort of stability is the lever by which "a wave forces a ship into motion, that if a ship were destitute of this "stability no wave that the ocean produces would serve to put her in "motion, whether that stability were due to a broad plane of flotation "or deeply-stowed ballast."

There is no foundation for this statement, for stability is the resistance which is offered to change from the vertical position; the effort of the fluid or gravity to restore the body to the rest it may have been disturbed from.

It is derived from two sources, a low position of the centre of gravity, and a broad plane of flotation.

If a vessel is inclined in smooth water both kinds will resist further inclination, or will seek to restore the vessel to the perpendicular at which she rested.

If the water-level be inclined, as in the case of a wave, that portion of the stability which is due to buoyancy will be exerted to bring the vessel's mast perpendicular to the wave surface on which she floats; in this process will be developed more and more that kind of stability

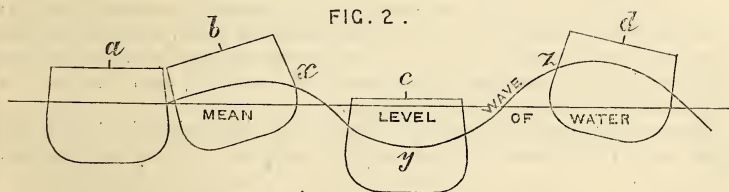


which is due to deeply-stowed ballast, or a low centre of gravity; under these circumstances the two kinds of stability are opposing, *not* concurring forces, as has been taught, one tending to bring the vessel's mast perpendicular to the wave surface, the other perpendicular to the earth actuated by the force of gravity. Therefore all calculations made on the hypothesis that stability is the cause of motion, as is done by some modern theorists, must be erroneous. Indeed these calculations are more erroneous than represented above, for they are made on a further erroneous hypothesis that the inclinations are round a comparatively fixed point in the middle longitudinal line of the ship and the rolling motions likewise!

Yet this is not true in smooth water, and is always untrue of all ships in a seaway.

The breadth is a lever through which still-water acts on a ship to produce *rest*, and also through which waves act to produce *motion*, but this is a different thing from stability, being the lever that produces motion, simply because breadth, under totally different circumstances, is an element in producing stability. Stability is an effect, not a cause!

Rolling motions of ships in a seaway are produced by the alternate rise and fall of the water supporting them, and the rise and fall of the floating body, accommodating itself to new and changed conditions, oscillates in search of, rather than possesses, stability, hence the motion. *Motion* is the result of *instability* and *rest* the result of *stability*.



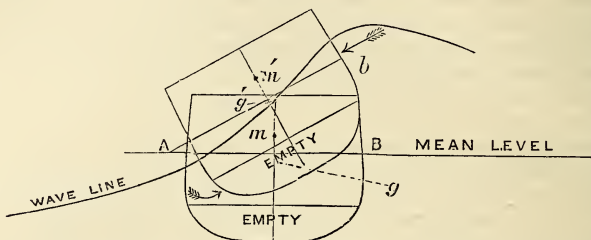
Suppose any ship floating in smooth water, as in Fig. 2, and waves to roll across her; as waves rise *above* the mean level, and the hollows fall below it, a vessel in passing over the intervening spaces must rise and fall.

Thus as the wave moves along, it will lift the side of a ship next to it, and will continue to lift and incline her at the same time until she is brought into the position of *b*; this rise and inclination will be continued till her middle line passes the crest of the wave at *x*, then her upper side will begin to lose support, and the vessel will begin to fall: in a short time this will change the direction of her inclination, and she will roll over to the other side, and will fall till the middle line reaches the bottom of the hollow at *y*; then the lower side will begin to rise and to change the direction of the roll, gradually bringing the vessel into the position of *d*, and so on, as long as the vessel is in the midst of waves, all through one side being raised first, then the middle and then the other side, and falling in the same order, and it is obvious



this process must take place irrespective of the stability being less or more, for the falling and rising must follow hollows and waves. Moreover, it is obvious that the point round which the body rotates is always *changing*, and is always *outside* the ship and at the opposite side from the moving force which operates first at one side, passes across, and then commences from the other side first. (See Fig. 3.)

FIG. 3.



A. The point of rotation when on wave face moved to the opposite side when ship is on the wave back.

A B. Mean level, and water line when upright.

A b. Water line when inclined on wave face.

Arrows show direction particles move in wave.

$g$  and  $g'$ . Centre of gravity.  $m$  and  $m'$ . Meta-centres.

$g m$  and  $g' m'$ . Meta-centric heights.

Therefore the attempt to estimate rolling motions from any power to resist inclination round a fixed axis by a lateral force, such as wind in smooth water, is misleading; and to assume an analogy between motions in the midst of waves and those produced by racing men from side to side, is delusive in the highest degree.

The motion produced by waves must vary with their height, distance apart, and the greater or less rapidity with which they move across the vessel.

Moreover the shape of the wave exercises a great and important influence; this is always changing, the face is never the same as the back of the wave, and this difference is greatly increased by the strength of the wind. The size also of every third or fourth wave varies.

Weather currents and tides are exceedingly dangerous to vessels with little stability; these make the wave exceedingly wall-like in form, so much so as to be a certain danger to vessels with high centres of gravity, as these seas would readily throw such on their beam ends.

These circumstances, the extreme ranges of draught in steam vessels, from lessened specific gravity of cargoes, and other things, involve the advocates of high centres of gravity with little stability on any pretence (and it can be no more than a pretence), in the very gravest responsibility. It is time that we were delivered from that dangerous error, that stability, especially that due to a low centre of gravity, is a cause of danger when, in truth, it is the prime element of safety—the only one that will save ships from capsizing!

A sufficiency of stability is necessary for the proper qualities of ships

as well as for safety; this is fully proved by the number of ships admittedly capsized because of its deficiency, and by the legislation as to deck-loads. Why it should be considered that stability is a cause of ships accumulating motion till they roll over, is out of all reason; indeed the promoters of this theory abandoned it when they placed from 350 to 600 tons of ballast in many ships, which they could not have done had they believed that this would eventuate in their accumulating motion till they rolled over; had any such tendency appeared in the "Sultan," they would not have added 150 to her previous 450 tons. If there was such a tendency, why is not the proof given? Is it not important?

The tendency of a low centre of gravity is to limit the arcs rolled through, and these ships are no exception. This also is established in the case of vessels laden with ore and other compact cargoes stowed low, from which their motions are so short and quick as to jerk their masts over.

As this experience is in harmony with mechanical law, those who state the opposite are bound to show when and under what circumstances the change of law takes place.

Ships for the most part are more or less like a rocking-horse set in motion, the ship and point of rotation rising and falling as the ship possesses a section of greater eccentricity, this varies with the proportion of half breadth to depth—a circular, cross section immersed to its axis is the easiest form.

The Bessemer scheme never could have succeeded because of this vertical motion, but to have put the machinery into a form of the extreme eccentricity, as was done, was to guarantee the completest failure.

As this modern theory does not recognise these indisputable facts, but jumbles up wave-motion and independent motions with extremely divergent elements in one ship as compared with another, that any one should accept it as true is really astounding.

Let us examine more closely this theory of accumulation for which so many important properties in ships are sacrificed.

It is said that a ship's roll in still-water produced by men racing from one side to the other, if repeated, will so increase her angular motion that she will be rolled over, also that if a ship have a short period of roll, her motions will synchronise with those of the waves in which she floats, and that thence she would have her motions so increased that she would be rolled over.

It is also said that if a vessel's stability be great, she will have a short period, and thus be liable to be rolled over; the greater the stability the greater this liability, so that stability would be a continual source of danger. To prevent this, it has been recommended and largely carried into effect to raise all the centres of gravity, and to increase the weight on and at the sides to lengthen their periods of roll.

Is there any justification for this course? None. Let us revert to the still-water process of rolling.

Suppose all the crew of one of our ironclads to be placed on one side, then raced across to the other, backwards and forwards frequently. If

the men wait until the roll is completed, a further impulse will be given each time they race across, and therefore the angle of roll will be increased, but the men must wait till each half roll is completed. As a consequence, the time of the first complete roll will be less than that of the second, and third, &c. ; then if the vessel's cross section is that of an eccentric wheel the centre of gravity will rise, and in its fall back will accelerate the motion, and tend to increase the angle of roll and alter the period. Consequently the period will alter with the form of the ship and with the number of rolls, irrespective of meta-centric height, and will not be the same for the angle of roll of any ship.

This is the case of a ship rolled by a force from *within*, and its time must be exactly adjusted each roll, or there will not be any increase of angular motion.

There is no inherent power in a ship to roll ; she remains at rest till disturbed ; how, then, compare a ship's period in still-water with her period in the midst of waves ?

At sea the rolling motions are produced by waves and *without* the ship, which take the place of that of moving the centre of gravity from one side of the middle line to the other.

How, then, can there be a synchronism between the wave-period and that which has no existence, for the centre of gravity is not moved at sea as in still-water ?

All motions in a seaway are produced by wind or water ; if the former does not operate, then waves are the sole cause of the motion. If the wave motion ceased, the ship would come to rest.

No doubt according to the form and disposition of weights, a ship will be more or less free to yield herself up to wave motion.

If a ship takes the motion of the wave, there can be no synchronism of motions, for there will be but one, commenced with one wave, terminating with the next. But no ship can take completely the wave-motion, because of her greater inertia than that of the water, and because there are always cross-waves and wavelets, as Captain Maclear observed, "not in one case in a hundred that you find regular waves ; " they are always confused ; there appear to be waves coming in all " directions, or one set overlapping the other, so that the greatest " difficulty is experienced in finding out what you actually observe " when trying to note the true crests."

Clearly no synchronism, such as is supposed by this impracticable theory can arise, for it requires a succession of waves to follow each other with great exactness of time, of size and form, to fit exactly with a ship's supposed independent motions and ever-changing rolls as every cross-wave and wavelet alters, in their measure, the ship's motions destroying the chance of synchronism, as a rule, and yet for the accumulation of angular motion a rule of great exactness is indispensable.

The floating body that will most nearly accept the wave-motion is a raft, wholly but not deeply immersed, and with the smallest inertia ; next in order a stage, then circular ships of small draught ; lastly, all other things being equal, the ship whose plane of flotation is greatest.



To compare ships' motions on the simple grounds of their meta-centric heights is most erroneous; for suppose a ship's cross section to be circular, and she immersed to the axis, her centre of gravity below this, also plastic, so that we can alter her form without change of cubic contents or weight, and her breadth to length as 1 to 4, and to be upright.

If a wave now roll up to her, according to its form and velocity, there will be more or less of lateral impact, together with a lifting force acting at the side nearest to it, which will incline her according to the inclination of the wave face on which she floats, and in the direction in which the wave and its particles *above* are moving, and this inclination will increase as the wave-centre passes on and across her, and until the centre has passed the ship's middle line, after which it will continue to lift her, but acting on the other side will tend to overcome the original motion before rolling her back.

As the tendency of smooth water was to retain the ship perpendicular to its surface, so that of the wave is to force the ship to take a perpendicular to the new and changing surface, and were it not for other forces, that is the position she would take from time to time, but because of these forces, her position will be a resultant of these together with that of the wave-force. Consequently a ship's period could not commence with, nor terminate with the wave-period.

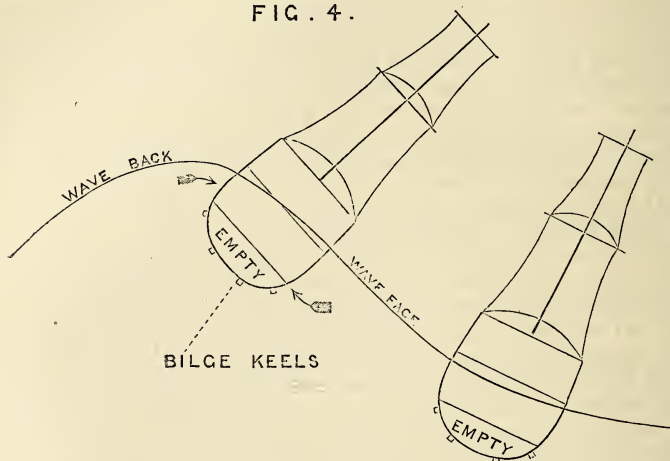
What then are the differences and what their causes? 1st. Besides the lateral impact and lifting motion that inclines her there is the motion of the upper particles moving *rapidly* in the same direction as the wave tending to push her over further than the perpendicular to the wave-face, then the particles *below* moving in the opposite direction, tending to push her keel or lower part with them, consequently these two acting as a "*couple*" incline her still further, nor is this all, for the ship floating on an inclined surface gravitates down it, at the same time that she is lifted over, and forced down it by the wave-motion and the fast moving particles *above*, if under the pressure of sail so much more so, then the water *below* resists both, because the particles there move in an opposite direction, and because the great pressure under which water deep down is, it cannot be displaced with anything like the rapidity of that *above*, all which tends to carry the vessel beyond a perpendicular to the wave face; in this case bilge-keels will only aggravate the incline, as they would tend to hold the keel or lower parts from slipping down the incline while the upper parts did so, all which would lengthen the period, consequently no ship can possibly take the wave-motion in the first half of the roll.

We have now to consider the back-half of the roll. The instant the centre of the wave has passed the middle-line of the vessel, its tendency is to lift the lower side, thus to arrest the forward action of the inclining forces, the loss of water-support from the upper side, and the gradual descent of the vessel into the hollow, also tend to change the direction of the roll; but because the forward motions of the particles *above* continue for a time to press her forward, and those *below* to press the lower parts in the opposite direction, the moments of inertia not being immediately overcome and given an opposite



direction to, the roll on to the back of the wave is never so great as that on its face; this difference is greater because the slope of the back is never so great as that of the face, more particularly in strong winds—for these reasons also the ship's roll cannot terminate with that of the wave.

FIG. 4.



We have now to consider what are the other causes which influence the extent of the roll that must inevitably take place.

We start with a given wave as to form, size, and velocity, and a ship of a given form and size.

Such will more readily and more nearly accept the wave-motion as her proportionate breadth to length is greater because this breadth will afford greater leverage to roll her over, and because the wave will be a longer time passing to her middle line, and so would be a longer time operating in lifting and inclining her, therefore her roll would be through larger arcs.

She will more readily accept wave-motion as the centre of gravity is higher.

She will accept more of the wave-motion as her immersion is less.

And in high seas, though more difficult to move in smooth water, and at first, once set in motion, the greater her moments of inertia, the greater will be her arcs of roll.

On the contrary, all other things being equal, the greater the size, the greater the immersion in undisturbed water below wave-motion, the greater also her immobility, therefore the less her motion in waves of a given height and force.

Also the lower the centre of gravity, the more it will resist inclination or rolling motions; for the lower it is, the further it will require to be moved out from the perpendicular at each increased angle of roll, therefore the greater must be the amount of work done in resisting

inclination and in limitng the extent of the roll, and as its tendency is to bring the vessel back from the roll forward, the more certainly it lessens the chance of synchronism.

If we now suppose the ship drawn out till her breadth to length is as 1 to 5, and the centre of gravity lowered to preserve the same stability as before, and her depth the same, the wave will have a shorter lever to lift her by, and it will be a shorter time operating to lift and to incline her, so she will not be carried so far over.

Then the centre of gravity being lower it will tend to limit the arcs of roll both to one side and the other.

The moments of inertia in a narrow ship, similarly arranged, will also be less, which, especially in high seas, will be favourable to small arcs of roll, this was observable in the "Solferino's" losing her place in rough weather, and more so as the weather was rougher, as compared with smaller and unarmoured ships. The greater length also tends to resist motion, so the long, narrow, ship has decided advantages in a seaway over a shorter, with a higher centre of gravity.

It will be sufficient notice of the pegtop shape to mention that the old "Albion" of that form of the same length and depth of immersion as the old "Rodney" rolled through  $47^{\circ}$  and 13 times while the "Rodney" rolled only  $29^{\circ}$  and 8 times, their stabilités, as estimated by inclination under sail or by calculation differed but little. The period of the latter was about 7 seconds, that of the "Albion" little over  $4\frac{1}{2}$  seconds; therefore, meta-centric height will not account for the differences in this angle of roll or its rapidity.

The "Rodney's" centre of gravity was lower and her moments of inertia less, so according to Mr. Froude's theory she should have rolled more deeply than the "Albion."

What then is the explanation of these enormous differences? 1st, greater breadth by 6 feet; 2nd, higher centre of gravity; 3rd, greater moments of inertia, and 4th, her pegtop form.<sup>1</sup>

Again, it is contended not only that there is no chance of a vessel with a long period rolling over, but also that such will scarcely roll at all.

How then, we ask, account for the large angles of roll of the following vessels, all with long periods?

"Hereules" .....	8 seconds	$25^{\circ}$
"Monarch" .....	$7\frac{1}{2}$ "	$37^{\circ}$
"Agincourt" .....	$7\frac{1}{2}$ "	$26^{\circ}$
"Devastation" .....	$6\frac{3}{4}$ "	$26^{\circ}30'$

These last two are reported to have rolled through some extraordinarily large angles which are not recorded. But why? Since these are the dangerous rolls from which these long periods have not saved them, and in these would be found the proof of accumulation of

<sup>1</sup> The meta-centric height of these ships being equal, the extraordinary difference in range and rapidity of roll must have been due to her cross section, making her into an eccentric wheel that no disposition of weight could alter—to raise weight would be to increase angle of roll already too great, to lower weight would be to increase the rapidity already too rapid.

roll had it any existence, why is the proof, whatever it was, withheld?

Again, the—

"Crocodile" .....	40°
"Northumberland" .....	7½ seconds 38°
"Minotaur" .....	7½ " 35°
"Volage" .....	10 " 53°

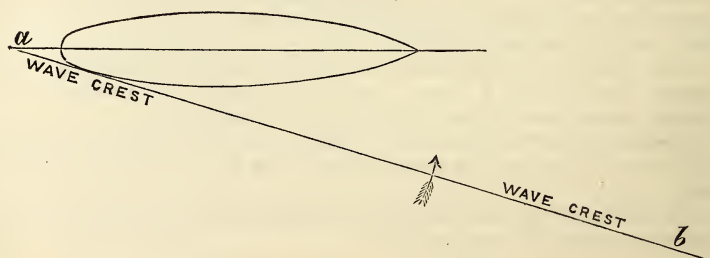
Period deduced from Table III:—

Mr. Johns' vessel .....	10 " 58°
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In no one of these cases is there any evidence that these large angles were the result of accumulation, and when Mr. White informs us that the "Devastation's" angle of roll was doubled by her steering a course that shortened the wave period and not her own at the same time, this more certainly precluded the possibility of synchronism.

The reason of the "Devastation's" increased angle of roll could not have been by accumulation, as he shows himself, it was because the oblique course she steered with reference to the wave ridge, or crest, kept her longer under the influence of the wave motion than when she had her broadside parallel to the wave, which was like adding to her breadth; this would occur to any vessel irrespective of her meta-centric height or period, but would operate to a greater degree on a ship with little stability or small meta-centric height. Herein is the danger to such vessels.

FIG. 5.



Suppose *a b*, Fig. 5, to represent the crest of the wave moving in the direction of the arrows, if the stability is little, a short length of the wave will incline the ship, and will incline her more, as more of it reaches her side, the extent of the roll will be increased as the centre of gravity is high, and the bottom empty, the fast moving particles above pushing her over together with the wave, and the slow moving particles *below* pushing the lower parts in the opposite direction. She meanwhile is a longer time slipping down the incline of the wave face, tripped up by her keel and bilge keels, and most so when the bottom is empty, which therefore *easily yields* to this double pressure on it.<sup>1</sup>

Indeed, Mr. White's explanation is an abandonment of the whole

<sup>1</sup> Fig. 5 supposes the ship moving obliquely *with* the wave, if not going fast, she

principle, for he asserts that the course the "Devastation" steered, and the rate she moved at, were the causes of her increased angle of roll, and *not* her less meta-centric height or changed period.

Were there any truth in his explanation then ships with registered angles of  $50^\circ$  or  $60^\circ$  would have the wave-period shortened to them, and their angles of roll doubled; I am sure Mr. White would not accept this logical issue of his explanation.

The Scientific Committee who accepted this long-period theory, recommended an increase of beam; it is difficult to understand with what consistency, for an increase of beam involves shorter periods and quicker, as such ships accept more of the wave-motion! This they were sensible of, and recommended the use of bilge-keels, the tendency of which, according to their own showing, is further to shorten the ship's period, in other words they adjust these periods so that the vessels may have the full benefit of accumulation, and its dangers, if any.

Mr. White contends for the existence of a law while he gives abundant reasons why it cannot exist; thus he says, "No ship exactly fulfils the conditions in the direction and magnitude of the fluid pressures. The importance and extent of these variations depend upon many circumstances, the form, the *magnitude of the ship*, her course, and speed relatively to the waves; the dimensions of the waves, the proportionate height to length," &c., and yet without reference to, or any estimate of these and other influential elements in the problem, he affects to have demonstrated the law of change and shown it to be entirely due to meta-centric height and moments of inertia!

What I had supposed law to be, was a rule or sequence of known facts, or forces, or quantities, but here the known quantities are eliminated, and the value of an unknown quantity is sought in terms of other unknown quantities. So far from there being any law, such as is supposed, and safety from applying long periods, these have increased the danger of capsizing by the action of the second wave synchronising with the motion produced by the first wave.

Is there no case of synchronism when the motion of the wave concurs with that of the ship to roll her over?

Certainly! but it occurs when the period is long, with little stability from a high centre of gravity, for then the ship is easily rolled far by one wave, and is without power to return to little more than the upright position, when a second wave catches her; if pressed by sail and is on the face of a steep wave, she will be rolled over.

This was the case of the "Captain," from which a higher side would not have saved her, since she was not so much rolled round a central point *within* her as round one *outside* her, and at one side,

will be long on the face of the wave, longer subject to its inclining force, liable to broach to and be rolled over if stability be small; she will not so early meet second wave.

If she steer to meet the wave, obliquely, she will be a shorter time under its influence and will meet second wave sooner, and shorten the period. If her course is sufficiently oblique she will have the benefit of some longitudinal stability and safety in proportion, hence the value of bringing one bow to the sea!



which lifted her up and pushed her over, facilitated by her slipping down the steep incline of the wave face, while pressed down by sail. She was also tripped up by the resistance and motion of the particles *below*, pressing in the opposite direction on her *empty* bottom which readily yielded to this pressure, so found its way to the surface, and whilst her heavy top-sides found their way down, the saved men getting out on her bottom. She had a long period—10 seconds!

This also was the case of the ship mentioned by Mr. Johns, N.A., only she escaped from not being under sail. He described two ships, in every respect, their lines, "their weights and distribution the same, "yet one behaved moderately well, the other abominably."

He adds, "After two or three weeks of rough weather there was no "question of the fact that the (latter) vessel had rolled  $45^{\circ}$  to leeward "and  $13^{\circ}$  to windward.

These observations were made with pendulum and batten.

This ship's period was double that of the wave, and yet, contrary to Mr. Froude's theory, "she rolled from the crest of the wave."

Mr. Froude's statement of the principle is, that "*if a vessel were "without stability, whether that stability were due to a broad plane of "flotation or deeply-stored ballast, the highest wave would fail to roll "her,"* or, in other words, as given by Dr. Woolley, "*therefore every "ship to be safe ought to have a very considerable period; and in order "to that she must have very little initial stability."*"

Mr. John further said of the ship, that she rolled on her side, rolled quickly, and that her period was double that of the wave, and that the wind could have inclined her only  $2^{\circ}$ .

Her rolling on her side is evident from her rolling  $45^{\circ}$  one way and only  $13^{\circ}$  the other.

Her rolling quickly seems a contradiction to the statement as to her long period, it may have been true, however, as to the first half of her roll, then forward, as she was then under so much pressure.

It is obvious that her stability was little.

How then account for her rolling on her side?

Having little stability, a steep-faced wave partly by impact and by its lifting power would raise one side first, then continuously aided by the wind and the fast-moving particles going in the same direction, would carry her beyond a perpendicular to the wave-face, she would gravitate down this steep face, while the particles *below* moving in the opposite direction would trip her up, all together, forcing her to roll from the wave crest.

Then the moments of her masts, she being light, and her moving to leeward with greater velocity, would tend to increase her roll to leeward by their increased momentum. The rolling back only  $14^{\circ}$  would arise from a high centre of gravity, thence little power to return, the particles *above* and those *below* would oppose for a time and the moments of her masts would not be overcome so early as those of the ship, her period being double that of the wave, she would have made only half her roll when the next wave would catch her at the upright position, and roll her over on her side again, so we have little less than a synchronism, because her period is *too long not too short*!

An increase of wind, or velocity, or size of wave, would have rolled this vessel over, thanks to her long period! We ask of what use could sails be to such a ship in such a condition?

This also is the explanation of the alarming condition reported of Her Majesty's ship "Volage," rolling  $35^{\circ}$  to leeward and  $18^{\circ}$  to windward, shipping green seas that washed men over her guns,—she also had so little stability that she inclined  $14^{\circ}$  when other ships inclined only  $6^{\circ}$  or  $7^{\circ}$  (see Table III), yet she was one of those ships that had been ballasted, but not sufficiently. The charge brought against her captain of not putting more sail on her is preposterous, since she had then too much; more would have proved fatal.

Here we have a 2,000 ton ship in danger, while the 500 ton store-ship, with sufficient stability, was quite safe.

The proper explanation of the "Volage's" rolling  $10^{\circ}$  each way in a nearly glassy sea, and after bilge-pieces had been given her, and the "Dreadnought" rolling much at one time and not at another, was their little stability; so a passing wave of considerable velocity set them rolling, and not the principle of accumulation. If that were true then a long period affords no safety, for these ships had that.

The effects of solitary waves may be seen every day, and many times on the Thames. They arise from waves thrown off from the paddles of powerful steamers passing across vessel's paths, and disturb the light and high centred vessels easiest and to the greatest extent.

The Wreck Register contains abundant evidence condemnatory of little stability, and its evil effects.

The "Princess Alice" was turned over when rolling deeply.

She had a large amount of empty ballast tanks.

The "Alice" was lost because of little stability; she also had 200 tons of empty tanks.

The "Thornby," 1,400 tons, was lost through diminished stability; she had 250 tons of empty ballast tanks.

The "J. R. Rea" was thrown on her beam-ends and lost.

The "Perseverance" was thrown on her beam-ends and lost.

The "Southern Empire," 1,500 tons, likewise.

The "William Lindsay," three days out, was thrown on beam-ends, and was lost.

The "Violet," crank, laboured heavily.

The "Stuart Hahnemann," 2,500 tons, capsized; heeled over gradually in fine weather, and foundered.

The "Tacna," capsized in fine weather, in the act of turning her head in for her port.

The "Great Britain," 880 tons, capsized, masts cut away, *righted*.

The "Sarpedon," thrown on beam ends; when mast and deck-load went, she *righted*.

The "Eastern" lay over half under water; when masts and deck-load were got rid of, she *righted*.

The "Western Empire," on beam ends; when masts and deck-load were got rid of, ship *righted*.

The "Broderik Castle," too stiff; dismasted, but ship and crew saved.

The "Lady Louisa," too stiff; dismasted, but ship and crew saved.

Of the large number of missing vessels 100, with 1,000 lives, many would afford like testimony did we know the history of their disasters, much of their deficiencies would have been from "over-loading," or "light cargoes," without sufficient ballast, as the "Stuart Hahne-mann," or shifted cargoes, or *free-water* in the hold from leaks.

I have shown that the so-called scientific theory affirmed by great names, in virtue of which sailors are required to stand upon their heads or to sit to be indoctrinated in it, has no foundation in sense or science (which is experience reduced to rule), not theories elaborated in the closet out of imagined facts.

Sailors have been in the habit in bad weather of getting down all top-hamper, housing main-deck guns, &c.; this was thought right in the dark ages, when it was thought that Nelson, Collingwood, and Exmouth were men of sense and sailors; in the name of science, we are told this must be reversed, the more deeply a ship rolls, and the greater the danger of rolling over, the more her centre of gravity is to be raised and deck loads encouraged with that view, and empty spaces below enlarged!

Arising out of this course, we have the anomaly of sailing ships that are unable to sail, or be steered or managed with their safety, or with that of other crews.

Captain May reported that the "Northumberland," of 10,000 tons, when caught in a heavy gale, should, if possible, steam at slow speed; the square sails should then be furled, the after trysail set, and the ship's head placed with the sea three points on the bow. This is the position in which the roll of the "Devastation" was doubled—so it appears Captain May gives a choice of evils.

Lord Guilford, speaking of the "Hercules," 8,700 tons, said, "She steered so wildly, and broached to so often, that he gave up the idea of running out of the gale, and hove to, with trysails, *using steam.*"

Sir Sydney Dacres, after considerable experience said, that though there was great advantage in the power of a masted ironclad to keep an assigned station in the open sea without using coals, it was not possible, masts or no masts, to do it in the Channel. He could not call ironclads sailing ships at all; "there was no sailing in them."

Sir Thomas Symonds "doubted the possibility of a ship displacing 9,000 tons, sailing well, even with a lifting screw; sails could scarcely be given her of proportionate size."

The "Penelope" was reported as always sailing on her side, though with reduced masts and sails, and rolled 30° each way or 60°. We may here ask Mr. White what unarmoured ship rolled this amount?

Sir T. Symonds reported against both the "Captain" and "Monarch," as steered with difficulty, the latter as taking sometimes an hour to wear, and attributed it rightly to their want of stability.

It was reported officially that the "Inconstant" would not stay without steam.

"Eclipse" was "*crank*" and an "*incurable roller.*" "Bellero-phon," Captain Wells said, "lay like a log on the water when



“hove to; that, if there was plenty of wind and the sea suited, she could be kept on her course; but it was difficult to keep her off the wind if the sea did not suit her; her after sails were of no use in keeping her to the wind; but, on the contrary, had to be set to wear the ship, under sail alone she was unmanageable, and more unmanageable in strong than light winds.”

This is the necessary consequence of insufficient stability. Similar unmanageableness, not to this unparalleled extent, is manifested in vessels of the Mercantile Marine when they have small stability. The marvel is, not that there are so many collisions and other accidents, but that there are not more!

In conclusion, we remark, that of the vast number of vessels that we have a record of, not one appears to have been rolled over because of having too much stability, while numbers are clearly lost every year from having too little, a further demonstration that the theory of rolling over by accumulation from synchronism, is without foundation.

A very large proportion of those lost, were vessels with cargoes liable to shift when the vessels are rolling, or by lee-lurching; and evidence is given that their cargoes did shift, evidence also is frequently given that when they are relieved of their masts or deck-cargo, they have righted sometimes too late as they have shipped too much water; this clearly establishes that they were deficient in stability.

There have been a few cases recorded where the stability was too great; in these cases, the masts have been rolled away, but the ships and crews have been saved, yet according to the Froude-Reed theory, these ships should have been rolled over.

It will now be said, apply what you have stated to “Inflexible.”

I have not sufficient detail about her to say whether she is safe or not, but I can say confidently, that she is the legitimate offspring of the system I denounced on the occasion of the loss of the “Captain,” for which Mr. E. J. Reed is responsible for introducing it into the Navy.

But if the “Inflexible” is unsafe, what must be the condition of the fleet of ships of the ricketty family *more* deficient of stability? Those without armour, pervious to every shot, and those with thin armour, that can be perforated like brown paper by a candle shot. Such from shot holes, from leaks and hurricanes, would appear amongst the missing ships without any detail of their disaster!

There is one ray of comfort in this controversy, arising from the fact that the original combatants who had all argued that, for safety, ships must have “*very little initial stability*,” are now abandoning that erroneous crudity, and are seemingly racing to see who shall give most stability, but no doubt in the worst form!

Neither party in the combat, however, have taken a safe basis from which to estimate the safety or otherwise of “Inflexible.”

Estimates founded on still-water periods or still-water performances give no reliable data for determining motions or dangers in the midst of waves, for the motions of ships in still water and those produced by waves, as the moving forces in the latter case, their number, direction, and effects are so entirely different from those in the former.



In the first case, the motion of the centre of gravity is the disturbing force which is moved horizontally; the forces turning the body are vertical, any lateral action is confined to the resistance of the water to the vessel's rotation, while the inertia is common to both in one phase, but in the latter it obtains in two forms.

In the second case, the moving force proceeds from *without*, and though the centre of gravity is moved vertically, together with the whole body, it is in no degree a moving force, which alone proceeds from the waves; then, besides the vertical forces lifting, lowering, and inclining her withal, there are the lateral forces of the particles above and below acting as a *couple* to rotate her, together with the tripping force as she slips down one face of the wave or the other, of which sailors are sometimes made intensely sensible, by the suddenness of *arrest*, and the depth of the lee-lurch.<sup>1</sup> (See Fig. 4.)

And lastly, in the first case, the vessel is rotated round a comparatively central point *within* her, which is moved but little, while in the second case, she also rotates round a point *without*, and at the opposite side to the moving force. This point changes from that side to the other when the forward roll is completed, and she begins to roll back, precluding the possibility of correct estimates by the method used for the "Inflexible." Thus only three moving forces are mentioned as obtaining in the problem, whereas there are six or more.

The Committee recommend (substantially) an addition of 10 feet to the beam of new ships in order to double their stability; this implies a doubt of the sufficiency of that of the "Inflexible." The effect of this increase will be to make them deeper and more dangerous rollers, to prevent which they propose deep bilge keels; the action of both these plans is to decrease the period, and give the ships the full benefit of the dangers of accumulation, if they exist. Thus the Froude-Reed theory is given up, which surely had better be done frankly, that the country may benefit by its open repudiation, than that it should be done by a side-wind.

The untrustworthiness of the meta-centric heights may be gathered from the fact that the "Invincible," with 2 feet meta-centric height inclined  $17^\circ$  without any sail, and yet the French "Ocean" class carry all sail without any ballast, and yet have only the same 2 feet, the difference being that the 2 feet is measured up in the "Invincible" from a *high* centre, in the "Ocean" from a *low* centre of gravity. In theory, as taught, this may not make much difference, but in practice it makes equal, at least, to the 340 tons of ballast placed in the "Invincible" to make her stand up, introduced after proof of the danger of her upsetting.

Again, the "Penelope" sails on her side, yet she has 3.5 feet of meta-centric height, while the French "Richelieu" has only 1.5 feet, and we do not hear of any complaint of her danger. The "Monarch" and "Eclipse" are unable to use their guns if only run out on one side.

<sup>1</sup> All sailors know that ships come down so suddenly into the hollow with the lee-lurch, as to shoot a wave from the side like a wave from the bow when going 10 or 12 knots.

These differences invalidate the present system of calculations and destroy all reasonable confidence in meta-centric height estimates, and are due to the fact that in some of our ships the weights are lifted 4 or 5 feet off the bottom in search of a deck-load on the plea "*to check rolling.*" (See Lecture by Mr. E. J. Reed on "Captain," at the Royal Institution.)

The "Captain" was designed to have had 4·6 feet of meta-centric height, less than enough with her empty bottom, yet had she not been received into the service with only 2·6 feet, we should have had her 500 men still amongst us!

I observe that the Committee on the "Inflexible" lay great stress on the effect of *free* water in her hold if she is damaged, in reducing, as they say, the arcs of roll. This is a most perilous idea to set afloat without explanation and caution, as it will lead men to think that it is advantageous not to pump ships quite out. Now, the effect of this free water in smooth-water-rolling may tend to reduce the arc of roll; but this cannot be the case in a seaway, for as it rolls to leeward with the lee-lurch, like shifted cargo it will tend to throw ships on their beam-ends; if at first it does not do that, it will retard her return to the perpendicular, thence the next wave will roll her further to leeward, and will exaggerate the roll, if it does not help her over.

I do not think anyone can calmly consider the records in the "Wreck Register" and not be assured that the effect of this free water from leaks is to reduce the stability; to give ships a permanent list; to render them unmanageable; and finally to lead to their being thrown on their beam-ends and foundering.

It ought not to be overlooked that the "Conqueror," a fine 90-gun ship of 3,000 tons displacement, was thrown and blown conjointly on her beam-ends without having a stitch of sail set, and was only saved by her swinging round, the sea taking her on the opposite side, set her up; yet she had a meta-centric height of 4·6 feet. What, we ask, could happen to such vessels as the "Monarch," "Inconstant," "Raleigh," or "Volage," if damaged, leaky, or if caught in a hurricane with stabilities represented by 2·2 feet up to 3 feet, reduced to 1·5 and 2 feet when coals and stores were consumed?

When the "Invincible" and her class proved so deficient in stability as to require 340 tons of ballast, Mr. Froude said that it was for the purpose of placing her centre of gravity where it was intended to have been; therefore we have a right to ask, what proof is there that the centre of gravity of the "Inflexible" is in the place it was intended to be?

What proof is there that the centre of gravity is where he supposes it to be when cutting her down to within an inch of her life, leaving no margin to cover these errors?

The cases given may be taken as typical of all that founder.

What is the remedy?

1. There should be a full public repudiation of the disastrous *no*-stability theory, and Architects should be held responsible for the lives lost through its use.

2. It should be authoritatively stated that nothing will compensate for a sufficiently low centre of gravity; for weight on the floors, and the less the proportionate breadth to length, the lower this centre should be.

3. All vessels of war, transport, &c., with little stability, should have this increased by ballast or by lowering the centre of gravity otherwise, to increase their efficiency and safety; and all new ships should have their centres of gravity as low as in former good and safe ships—such, for instance, as the old “*Trafalgar*” of three decks.

4. All vessels carrying light cargoes, including wood of most kinds, should be compelled to carry ballast; a fixed quantity for every 20 tons of goods proportioned to its small specific gravity, unless they have a sufficient quantity of iron or ore as part cargo stowed low down.

5. Some better method of determining what ought to be the maximum immersion should be devised—painting a water-line is a deceptive farce.

6. All vessels carrying cargoes liable to shift, such as corn, seed, rice, coals, and even wood, should be obliged to have two perpendicular fore and aft bulkheads carried up as high as possible; these, while they would secure the cargoes from shifting, would so strengthen the ships, making them into hollow girders, and distribute the strain from the bottom, and would effectively strengthen long narrow ships, so that ships would be far less subject to leaks and to disaster, and the cargoes would be less damaged in transit. I need hardly say it would effect a great saving of life. In fact, everyone would reap a benefit from such.

It appears to me that there is an idea current amongst many that vessels with heavy cargoes, including coals, may be loaded to any amount they can carry in harbour, without any more danger at sea. This is a fallacy that ought to be exposed. Three inches of freeboard are too little for every foot of immersion, more particularly when the proportionate breadth to length is great. It is absurd to make no difference in this allowance where the proportionate breadth is great!

Some statements of Mr. White require special mention and inquiry. Notwithstanding the upsetting of the “*Captain*” from insufficient stability, the risk run by the “*Invincible*,” and the deficiency in this respect of all her class, the “*Sultan*” and her class, and others, the supply of great quantities of ballast and reduction of sail in many cases, to make the ships safe, he says that the designer had no misgivings, and even that it was by *design* that greater stability was not given!

We ask, was it not by *design*, and with the concurrence of the Constructive Department that all this ballast was placed in these ships? Was it not by *design* that their sails were reduced?

For Mr. White says of this modern theory that led to this extraordinary reduction of stability:—“The highest authorities in this country, in France, in Italy, and elsewhere, are unanimous in their ‘acceptance of its principles.’” Then, were the *designs* correct, and the alterations made in order to insure utility and safety erroneous?



This language is all the more remarkable, as Mr. White teaches that every ship to be safe ought to have very little initial stability.

I may, as on the occasion of my lecture here, on the loss of the "Cap-tain," be charged with producing alarm in the minds of sailors. I am free to confess that I felt it my duty to incur that responsibility in 1870, prior to trials, subsequent to which many ships have been largely ballasted and fully justified my warnings. And in the face of the melancholy fact that 1,000 lives were lost in 1876 in 100 ships missing from deficient stability in design, from deck-loads, or from overloading, &c., with my strong conviction on the subject, I should feel that I was wanting in humanity did I not protest in the strongest terms against the doctrine by whomsoever propounded—"that in order to be safe, ships should have VERY LITTLE INITIAL STABILITY;" in other words, they should be difficult to steer, should be unable to carry sail, and should be easily upset!

Mr. WHITE, Assistant-Constructor, Admiralty: I must apologize first of all for being unable to attend the whole reading of the paper. I must also thank Admiral Fishbourne for his courtesy in sending me a copy of that paper. My copy, however, did not contain the concluding sentences just read. He is fearful whether ships are to be built which are to consign hundreds of our gallant seamen to a watery grave. He seems to think I am in favour of building ships with no stability; but I think I shall be able to show that this is quite a mistake. Permit me to read one passage from my paper which will be quite sufficient answer to this. It is this:—"Enlarged experience with bilge-keels has proved that these appendages may be trusted to limit the rolling of ships, having a moderate but sufficient amount of stiffness, and to place them on terms of equality as to steadiness with cranker ships having less powerful bilge-keels. With this experience as a guide for naval architects, there is no probability that the stiffness of future ships will be diminished to the same extent as it is in some existing ships designed before the steadying effect of bilge-keels was so well established." I am one of the last to wish to deprecate fair criticism, but I think when quotations are made from one part of a paper there should be also fair quotations from other parts. The copy of Admiral Fishbourne's paper which I had the pleasure of receiving did not contain any remarks such as those with which Admiral Fishbourne concluded, so that I am not prepared in the same way to answer them. But let me take up in succession just a few of the more important points in that paper, more particularly as it affects a criticism of my own. From my previous acquaintance with Admiral Fishbourne's writings on naval architecture, I was perfectly prepared to find that he did not agree with my belief in the soundness of the modern theory. I may add I do not expect anything I can say here to-day will convince Admiral Fishbourne; my great desire is to make clear what was the meaning of my paper, as it seems in some points to have been misapprehended by Admiral Fishbourne. The soundness of this modern theory is one important point. Admiral Fishbourne repeatedly says that the modern theory gives the "go-by" to accepted principles, dynamically and hydrostatically. He says it is mathematically unsound. What is the answer to that? The answer is, that men of the eminence of Sir William Thomson, Professor Rankine, the Professors in the French Naval School, men of the highest standing as mathematicians, the leading Italian naval architects, and others I might name—mathematicians as well as naval architects—without an exception accept the mathematical soundness of this theory. Admiral Fishbourne has taken upon himself, as an authority on this subject, to say that this theory is mathematically unsound. I mention these authorities and do not put my own opinion against his. I believe I am right in saying also that Mr. Scott Russell has expressed his concurrence with the general principles of the theory; but from the "Transactions" of the Institution of Naval Architects you can gather undoubtedly that Professor Rankine and Sir William Thomson and others are in favour of the mathematical soundness of the theory. So much for that. Next, as to the



agreement of the deductions from this theory with fact. In my previous paper I gave a few examples of one department of the subject. My paper was simply intended to put before this Institution briefly a few of the broad practical deductions from the modern theory. One of those deductions is this: if a ship is set moving in still water by any means, and then is allowed to move freely, the time she occupies in swinging, from out to out, would be called the "still-water period." I find that "period" is a term used by Admiral Fishbourne in many senses in the course of his paper; but I am speaking of the "still-water period" in my table which Admiral Fishbourne quotes. The longer that still-water period is, the steadier, as a rule, should the ship be at sea. On the whole, I said this would hold good, not always. I do not expect any ship to always stand up and let the waves roll under her. This deduction from theory, I say, is supported not merely by the figures I gave, but by Admiral Fishbourne's own tables. But then I said further—and this is what I want to notice most carefully—I said that in the still-water period there were included the effects both of differences in meta-centric height and in the distribution of weights which influenced the moments of inertia. When I speak of period, therefore, I am including both those things. Thirdly, I said—and of this Admiral Fishbourne has taken no notice whatever, although from the passage I have just read it is one upon which I dwelt most prominently—that the addition of bilge-keels had a most important effect upon the behaviour of a ship, as to the amount of disturbance she made in the water as she rolled about. I believe I am not doing injustice to Admiral Fishbourne when I say he does not in the least apprehend the importance I attach to that aspect of the question. I only find him criticising remarks on the meta-centric height.

Admiral FISHBOURNE: I let you speak for yourself.

Mr. WHITE: I have carefully read Admiral Fishbourne's paper, but in my own copy I do not find prominence given to my remarks on bilge-keels. Now, coming to Admiral Fishbourne's tables. Admiral Fishbourne objects to my tables as incomplete. They were not put forward as complete, and purposely so. But I have now to refer to his tables, and to try to prove my case, which may be stated as follows:—The *longer* the period of a ship, the *steadier* she will be on the whole. Take Table IV, in which there are several ships having a period of 5 to 5½ seconds. The ships are placed in the order of their rolling. Leaving out the "Topaze," and taking the ironclads, I will ask you to notice whether the law of the steadiness varying with the period is not fairly fulfilled, as a general law. I am not saying that there are not exceptions. You will find the "Lord Warden" has 62° of arc of oscillation, 5 to 5½ seconds period; the "Hercules" 8 seconds period, and less than half the angle.

Admiral FISHBOURNE: Would you kindly prove the connection? I have shown you another law, a law of weights, that they roll according to the weights. You should disprove the one, and prove the other; this you do not do.

Mr. WHITE: I must appeal to you, Sir. I am following, as far as I can, a particular line of thought with reference to Admiral Fishbourne's paper; and it is rather confusing to be interrupted. Respecting the exceptions, I should say these are cases which prove the rule. I may add, that the law of relation of period to steadiness is a direct deduction from a mathematical investigation; and if Admiral Fishbourne would like to follow it, I should be most happy to place it at his service. Now we will take another of his tables. Take Table V, which I consider one of the most composite constructions ever put on paper. Admiral Fishbourne has there taken two squadrons of ships—one English, the other French—which were at sea at different times, under circumstances which I am sure cannot be definitely compared, and which Sir Spencer Robinson, in reporting on the matter, says is a comparison to be taken simply for what it is worth. Any gentleman who wishes to test my accuracy upon that point can turn to the report of the Committee of Designs, 1871. In this table there is the "Achilles." The "Achilles" is a ship which Admiral Hamilton, whom I am glad to see is present, has himself told me, is a ship which in heavy weather behaves magnificently; she is also a ship of long period. Yet, on one occasion, in an almost glassy sea, the "Achilles" rolled more heavily than ever before. Why? She was of the same breadth, she had remained unchanged, but the state of the sea had changed, and Admiral Hamilton informs me again that, so

far as he could note, there was a very close approximation to synchronism between the roll of the ship and the swell that passed the ship. I have simply had the opportunity (which I am most proud to have had) of studying the results of observations made by gentlemen whose desire was not to prove one theory or disprove another, but who go to sea and give us the benefit of their experience; and I have come already to the opinion that the facts bear out very fully the relation between period and steadiness, and I think I have pointed out in these tables confirmatory facts. In Table IV, the "Lord Warden" is stated to have a meta-centric height of 4·6 feet, and Admiral Fishbourne says, one reason she behaved so badly was, that she had such a small meta-centric height. I do not know where Admiral Fishbourne obtained his figures for the meta-centric height, but, on carefully inquiring at the Admiralty, I am told the ship has never been inclined, so that the information given was scarcely trustworthy. The fact is, that the "Lord Warden" and "Lord Clyde" have never been inclined; they are such broad "dumpy" ships that their stability is assured, and in all probability the "Lord Warden" has as great a meta-centric height as the "Caledonia." As the "Lord Warden" has never been officially inclined, it follows that the figures (4·6 feet) and the deductions based upon them are not correct. Turning to Table II, I believe I am right in saying, that those figures were taken from the capital accounts which appeared in the *Times* of the behaviour of the squadron in 1871. May I ask why Admiral Fishbourne did not say, "at sea, 28th September," and "at anchor, 19th September," because I think a day is quite ample time for some difference to arise in the seaway. There are two other most remarkable things in this table. I find from the *Times* that the ship which rolled most heavily when at anchor was the "Lord Warden" (36°), but the "Lord Warden" does not appear in that table. In the second half of the table, "for ships at sea," there is another most singular omission. There was one ship in that squadron which had a long period, but she does not appear at all. She was wonderfully steady, for while the "Caledonia" was rolling 50°, the "Monarch" only rolled 4°, but she is not named. There is another omission of the "Monarch" in Table IV, wherein the oscillation of the ships (the "Topaze" always being an exception, and a most remarkable one) has been shown to agree with the law, that the ships with long periods are steady, and the ships with comparatively short periods unsteady. The *Times* reporter, writing about the first half of the Table II said—and he had not any theory to support—the behaviour of the "Monarch" on that day at anchor was one of the most singular things he had ever seen. Her remarkable general steadiness was so utterly contradictory of her behaviour on that day. The natural inference is, I think, that there must have been something singular in the state of the sea. Next, I want to say a word respecting Admiral Fishbourne's deductions as to the relative steadiness of English and French ironclads. Those deductions are made by putting together trials made on different days at different states of sea. I do not think that anyone who has ever been at sea can expect that ships not tried simultaneously can assuredly be tried under identical conditions, and if not so tried, their qualities cannot be compared fairly. I do not look on this as at all a personal matter. I stand here as an unworthy advocate of a theory which I most firmly believe, a theory which the more I see of it, the more convinced I am that it is a wonderful advance upon anything which went before. The question of co-periodicity is a very old one; the ship falling in with waves having a period about equal to her still-water period is likely to be subjected to the heaviest rolling. That is no modern view, it is simply a deduction from a modern theory agreeing with a much older theory. Coming to Table III it scarcely appears to be a table you can put much trust in as a test of the behaviour of a ship. When a ship is rolling only 2°, the rolling requires very careful measurement; but I want to show that even taking these small rolls, the general law named at the outset holds. The periods are given in the table, but I must point out a mistake or two in the "period" column. 7½ to 8 seconds is about the period of the "Minotaur" class. It will be noticed that these three ships do not behave exactly the same: 5·2° and 8·6° are the respective arcs for the "Minotaur" and "Agincourt," which are sister ships. Now, look at the "Warrior." She has, we know, a shorter period than the "Minotaur" class, and rolled 10·5°. Next look at the "Inconstant;" she rolls only 2·5°; look also at

the "Hercules" and "Monarch," and it will be seen that the ships which rolled least are the ships with the longest periods. That is still further confirmation of the general law. But let me point out one apparent contradiction to that law. The "Volage" is credited in the table with a period of 10 seconds, and yet she was the heaviest roller. Now fortunately she has actually been rolled in still water, so that I can state with certainty that instead of her period being 10 seconds it is  $5\frac{1}{2}$ . This divergence shows that in such circumstances the rolls noted per minute do not always correspond with the true still-water period of the ship. On the whole, therefore, Table III may be claimed to be a still further confirmation of the view that ships with the longest period are steadiest in a seaway, other things being equal. I looked with great surprise at the tabular statement preceding Table IV, where Admiral Fishbourne had tabulated the figures from my tables in a particular way. Any one who will take the trouble to read my paper will find I did not put forward those figures as exact measures of the effect of period upon rolling. Sister ships are recorded as behaving very differently without any change of period, other points of differences influencing the behaviour. But in Admiral Fishbourne's statement you have put together as due to differences of period alone, differences of behaviour which I do not think should be classed under that head at all. They were due to other differences of condition of which the reports we get of the ship show nothing. Now I am going to base a still further argument for the modern theory upon Admiral Fishbourne's statement about the behaviour of the "Rodney" and "Albion," rather old ships now. On page 73 (9 of proof) Admiral Fishbourne says the "Albion" rolled  $47^\circ$  and had a period of  $4\frac{1}{2}$  seconds, and the "Rodney" rolled  $29^\circ$ , and had a period of 7 seconds. Is not that exactly what the modern theory teaches? viz., that the longer period gives you the steadier ship? Of course I cannot now go through the whole paper; but I hope I have made good this position, that there is something to be said in support of the modern theory, and that a long period is conducive to steadiness. I want, however, again to give the utmost prominence to the statement that we have learned by experience. Now we know that bilge-keels can be trusted to make ships steadier. Such keels have been added in recent ships with an increase of stiffness and without any sensible loss of steadiness. Admiral Fishbourne criticises my statements as to the behaviour of the "Devastation;" but I look upon the experiments with the "Devastation" as the best possible proof of the important influence upon rolling of synchronism of the still-water period of the ship with the period of the wave. Admiral Fishbourne, no doubt inadvertently, made a great mistake and misrepresented what I said on this point. I said that in the trials of the "Devastation" synchronism with the waves was due to the fact that she ran away from the waves: but Admiral Fishbourne says: "The 'Devastation's' angle of roll was doubled by her steering a course 'that shortened the wave period.'" I think it is possibly a misprint. I said that the course steered virtually "*lengthened* the relative wave period," and that fact makes all the difference. The ship's still-water period of course remained unaltered, but the effective wave period is affected by the speed of the ship and the direction in which she moves. And when the "Devastation" ran away from waves which had a shorter period than her own still-water period, and went obliquely, she followed just such a course as to make the waves just synchronous with her own still-water period.

ADMIRAL FISHBOURNE: Do you say it was by accumulation?

MR. WHITE: Yes. I say that with a long period there is much less chance of that synchronism being established which leads to accumulation: that is the view of the matter I put forward. I do not wish to trouble the meeting with any further remarks. I only wish to say that having carefully read Admiral Fishbourne's paper, I am of opinion that Admiral Fishbourne has not advanced any new fact which at all takes away from my belief in the practical accuracy—not the exact accuracy—attaching to the deductions from the modern theory of rolling as enunciated by Mr. Froude.

MR. SCOTT RUSSELL: I need hardly repeat what I have once or twice said here, that I consider the opinions of a naval Officer upon the behaviour of ships, and upon the qualities every ship ought to have, as far more important than any ideas of a shipbuilder if he has not been to sea in his ships, and far more important than any notions of men who do not know what sea-going is. I therefore feel that we



are greatly indebted to an eminent member of the naval profession who has seen a great deal of service in the various oceans of the world, and who now takes the trouble to give us his ideas as to the qualities of a ship. Now, we have had a great deal of talk about modern science, and a great deal of talk about modern practice in recent times, and it has been very customary, and we have almost fallen into that groove this afternoon, that on the one side we should say science is everything, and on the other side we should say practice is everything. Now, in this case I really must come in as a reconciler of the two. I do think that a little science is a very dangerous thing, and I do think that a very great deal of science, if to it is added a very great deal of practical experience, make a compound of very great value. Now, with regard to the science in this point I agree with Mr. White, and I am quite sure Admiral Fishbourne will not say anything else, that the theory of the coincidence of waves and of periods of oscillation, and of periods of rolling and their effects upon one another, are something so long known and so well known to everybody that anything about the coincidence of oscillations and their effect on each other, and their stopping each other, and their increasing each other, has no novelty in it; and therefore if you were to say to me now "I assure you that in the next voyage you make across the Atlantic I will ensure you waves of one period for the whole length of your voyage there and back again;" I say if any man is theoretical enough to assure me of that, and was impractical enough to tell me to build a ship which should be in a certain non-synchronous relation to those particular waves, he would be certainly very theoretical; and I certainly should be very impractical if I dreamt of building a ship for any such theoretical sea. Now, then, I say that those sailors who are in the habit of going to sea in ships and of studying the relations of their ships to the waves of a storm and hurricane or a great swell, I say these men do rightly and well, and the more they study the waves of the sea, and study how to manœuvre the ships in relation to these waves when they come, the more they do that, the better. But the idea of building a ship merely that in some particular state of the sea its motions should be synchronous or unsynchronous with those waves is perfectly preposterous, and I say therefore that the mere period of the spontaneous and free oscillation of a ship going to sea is a matter of comparatively trifling importance; and with the knowledge of a sailor how when he gets into a sea with that period so to manœuvre his ship that the synchronism shall be of no importance, which I need not tell any sailor who is here, we all know how to do—I mean all of us who have spent, as I have, much of our life at sea—we all know when the period of the water is such as to make our ship roll, how to put our ship in circumstances in which she will not roll. That being so, I call that a mere element of manœuvring, and I do not call it in the least degree an element of the construction of ships. Mr. White gives, in my opinion of it, an utterly erroneous theory when he says "make ships for some one period of oscillation" for probably that ship in a voyage will never meet with waves for that period of oscillation, she will not have perhaps half-a-dozen times in her life. Therefore, I say do not make a ship for any such purpose. But what does he say? He says, "We first make a ship which, from some other elements, has a great tendency to roll," and then he says "I counteract that tendency by doing what? by sticking on bilge-keels," as if a bilge-keel was not an odious excrescence, was not a waste of material in the wrong place, and was not an utterly unseamanlike, unseaworthy expedient of a bad shipbuilder who had bungled and made a bad job. I say then that if you want to unite sound principles and sound practice you will accumulate the experience of good sailors and of good shipbuilders, and I am happy to say that there have been many shipbuilders for a couple of centuries who have known how to build good ships, and how to give them good qualities; and these men are perfectly sound while many of our modern imaginings are perfectly unsound. What then is the practical point in the construction of a ship? I will give it in the fewest possible words. In the first place, every sailor tells me that he wants in a seaway to have a steady platform for his gun. He does not say that he wants his gun to swing up and down once in so many seconds, he does not say he wants this platform to oscillate in this way and the other way. He says "I want a ship to give me the steadiest gun platform I can have whatever be the state of the sea, and whatever is the period of the oscillations of the waves." Now, is that a practical thing or is it



not? If that is a practical thing, then there is the first law of building a ship-of-war. Now, I say distinctly that the ship of the steady platform is the contrary of what this modern science recommends. Your time will not allow me to tell you what that ship is. If you wish to go into it at some other day, I shall be happy to show you what it is. But there is a ship with a perfectly steady platform, and I am sure Mr. White has studied the period of ancient naval architecture. I suppose he knows how they built steady ships? I suppose he knows how the wonderfully steady gun platforms of the French vessels were produced previous to the great wars?

Mr. WHITE: Sailing ships?

Mr. SCOTT RUSSELL: I know no reason why a steamer should not have all the qualities of a good sailing ship. If you say you will have a steady stable platform, I say the old-fashioned principles of shipbuilding show us exactly how to do that, and if Mr. White thinks that there is any escape for the shipbuilder out of it, in saying that he has now to build steam vessels and armoured vessels, I say, on the contrary, the very fact that you have to build steam vessels gives you the disposition of a thousand tons of ballast to put where you want it. And what is the thousand tons of ballast? It is the boilers and the engines and the propelling apparatus. There are a thousand tons of weight, which I have recently seen in modern ships, of whose building I won't say, distributed in the most uneconomical, unseaworthy, worst manner possible. I have seen the engines and boilers of steam vessels in our modern science ships so disposed, by the arrangement of weights, as to give the vessel all the worst qualities a vessel can possibly have. Now, I say there is no excuse for that, because when you have a thousand tons of engines and boilers, you have only to set your brains to work and settle where these engines and boilers shall be in reference to their stores of coal, and in reference to the other things in the ship, and you will be able, out of these combinations, to make the best possible ship. I go now to the next point. The next point after the stable platform is what? The next point is, that whatever be the periods, no matter what of the waves, the structure of the ship shall be such that her motion on the waves shall be an easy gentle motion and not a violent one. That you call a seaworthy ship; and if you have done the first thing, given her a stable platform, and then have done the second thing, which is to make her an easy and gentle roller, which has nothing whatever to do with this particular period of roll, then you have combined the two things wanted, a sea-going ship and a good gun-carrying ship. Now, when I tell you of the advantages you have in a modern steam-ship of disposing, at your will, of all the loads necessary to that ship in a wise manner, I say then, you know nothing of your practical business, nothing of the true theory of shipbuilding, if you cannot make your vessel with a stable gun platform and an easy gentle rolling motion at sea. Those are the two conditions; and if you follow those two conditions, I undertake that any sailor that takes out your ship will say "thank you for having given me a good ship."

Admiral FISHBOURNE: With respect to the tables, I have given such tables as I had. I have always had a difficulty in getting data. Table V is not of my putting together. The ships are placed in order by Sir Spencer Robinson. In addition, the Admiralty report says that the French ships were under worse circumstances, because they had a beam swell. What I understand is, that if they had not had that beam swell, they would not have rolled so much, and yet, notwithstanding that, they do not roll so much as the English ships. Mr. White asserts and re-asserts the value of small meta-centric height and long period. He says there is a law, but fails to show it. Take, for instance, the French ships. They roll in the order of their weight. He is bound to show that that is not the case. That the difference in the angle of roll does not arise from the difference in their weights, but, from what he asserts, their long period. The contrary is established. Take these two ships, the "Volage" and Mr. Johns' vessel; they are two vessels with the longest period and largest angles of roll,  $53^{\circ}$  and  $58^{\circ}$ . It is a matter of fact that the "Volage" has a small initial stability and a ten seconds period. It is a matter of fact that she rolled  $35^{\circ}$  in one direction and  $18^{\circ}$  in another. And that deficient stability is identified above with a long period. Mr. White says her period is only  $5\frac{1}{2}$ . My answer is this: I do not care a straw for the period in still water, it is no measure of the period at sea, and in no case do we find the still-water period to be the same as the period at sea.

Mr. WHITE : May I be allowed to explain one thing? The modern theory does not suppose that the actual period of oscillation in a sea-wave is the same as the still-water period.

Admiral FISHBOURNE : I am stating the actual fact. I set no value at all upon the still-water period. What we want is the actual practical result at sea ; is that ships shall not roll much at sea ; is ships that will carry sail and be safe. The proposition on the part of Mr. Froude is to give them no stability. He says, "If a vessel were without stability, whether that stability were due to a broad plane of flotation or deeply-stored ballast, the highest wave would fail to roll her. What is the argument? We will give her as little stability as possible, because the more stability we give her, the more she will roll. We say, as a consequence of giving little stability to a ship, that she goes over far, steers badly, and cannot carry sail. I have given you quotations to prove that. Here is the "Sultan," she carries 600 tons of ballast, and her masts are cut. The "Shannon," she also has her masts cut. Why? I believe what Mr. Reed said was quite true—that there is no reason why armoured ships should not sail, except that they are not given stability to stand up and make their sails effective. Mr. White will not dispute Mr. Johns' statement, as he is a naval architect and was in the Admiralty, and he states that he was reluctant to come to the conclusion that he did ; that the vessel he spoke of rolled 45° in one direction and 13° in the other. It was not until after a long series of trials that he acknowledged the fact. He gives her period as ten seconds. How do you explain that? I say there is no way of explaining it except in my way, and it must be patent to everybody that if she has a ten-seconds period, and the wave is five seconds, she can only have taken one-half of her roll when the second wave would come up ; and that is the history of her rolling on her side—just what Mr. Johns describes. With respect to the "Achilles," I think I have explained what took place by reference to the case of the "Volage." It is a thing that may be seen any day in the river. A solitary wave will roll across, and if a vessel has little stability, such as the "Achilles," it will roll her in proportion to its rapidity and its size. I have seen one small wave in an otherwise glassy sea come in and almost roll a vessel over, washing everything off her deck, so that the men had to lash themselves in the rigging, they having seen it coming. It is caused by the impact of a solitary wave of great velocity, and I have no hesitation in saying that if ships with little stability are caught in that way, they may be turned right over, and therefore any one incurs a very solemn responsibility who gives small stability. Mr. White thought I had not fairly dealt with him. I said Mr. White himself did not approve of the theory, because he told you a number of different elements came in to modify the result. I gave his own language, but mark what is his answer—that there is no fear lest little stability be given now that we have found the value of bilge-keels. But what are the bilge-keels for? If the smallest stability and long period produces the result required, why do you want bilge-keels? Is it not a broken-down theory that needs to be patched up by bilge-keels? I think it is a matter of common sense that these bilge-keels will have a very contrary effect to that expected. In still-water rolling the ship will come to rest sooner, but when on the waves, slipping down the wave-face, bilge-keels will increase the danger, will trip her up. If bilge-pieces had been stuck upon the "Captain," she would have been capsized all the sooner : she would not have waited for the second wave. She would have rolled over the first time ; and that is what the effect of bilge-keels will be. Then what is the use of ships if they will not steer? What can be more dangerous? Such ships are not safe-keeping company, and we cannot be surprised when we hear of ships running into one another, they not being under control. Mr. White has not made one single point in answer to my paper. He has implied that with respect to that table I have omitted some ships. I say I have omitted none. I have no object to serve by any such omission. They are old tables, brown with age ; and they are not produced except to show this meeting the utter un wisdom of trusting to any one table. I do not care who the observer is, there are idiosyncracies—a personal equation—with everybody, and that is invariably siding in one direction. I believe the reason this theory has obtained such favour is because there was a preconceived idea. People say, "Sir William Thomson and Mr. So-and-so say it must be true." Mathematics are very good as long as the case is stated truly. We are told if the

vessels have no stability they will not roll at sea. Can you believe it? And yet it is upon that basis that Mr. White sets to work with his mathematics. Sir William Thomson has just looked at the calculations, and assumed that the statement of the case to which the mathematics were applied, was true. With respect to the Scientific Committee, it accepted Mr. Froude's principle as true, and made a report accordingly, but in the *interim* between the first and second report, the "Inflexible" nearly capsized, and then what follows? Why, a practical repudiation of the theory; they say if it is possible to give more stability without increasing the rolling motions, such a thing would be very desirable. I say, what is giving increased stability but a practical break-down of the whole theory? The recommendation as to the "Inflexible" is to increase her breadth 10 feet and double her stability. That is a repudiation of the whole principle, which has been as little stability as possible, because increased stability produces short periods, and that is dangerous. Why, here they are producing short periods. How? By breadth; and they are producing short periods by these bilge-keels; the very thing they profess to dislike as dangerous they are bringing about, showing plainly enough they do not believe in the theory they have set up.

Admiral NOLLOTH: It appears to me that, taking the most favourable view of the theory of little stability, disadvantage preponderates.

If waves could be made to order, and the ship were constructed with a rolling period of the most suitable kind to avoid rhythm, synchronism of lee-lurch and wave-impact would still, as at present, frequently take place; and with ships of long period and concomitant large arcs of roll, I think the remedy would be worse than the disease.

In the case of huge ironclads with great momentum of sides when once in motion, and heavy wall-sided seas with no friendly slope gradually passing to leeward, and mitigating before arresting and finally reversing the direction of roll, little stability might prove of fearful importance.

In my humble opinion, decided advantage should be clearly established before consent be given to great restriction of the stability element in either ironclad or ordinary sailing-vessels.

Mr. SCOTT RUSSELL: I entirely agree with Admiral Nolloth that the theory of slender stability with long periods of roll is false and dangerous.

The CHAIRMAN: It now remains for me to give our thanks to Admiral Fishbourne, and on behalf of the Institution I may safely say we are all very glad indeed to welcome facts.

NOTE.—In justice it should be stated I was not aware how great was the estimated stability of the "Inflexible" when I read this paper. I had supposed, from Mr. E. J. Reed's statements, that she could have little more than he was in the habit of giving, *i.e.*, 3 feet of meta-centric height after 350 tons of ballast had been added, or less than 4 feet in the "Devastation," with an empty bottom capable of containing near 1,000 tons of water, whereas, the "Inflexible's" meta-centric height is 8·5 feet higher than almost any vessel's, except American monitors and the Russian circular ship, which has 8·9 meta-centric height.

Then as to her capsizing when well-nigh destroyed, it is only what sailors have to expect, as in the case of "Java" "Gueriere," and others. This chance can be reduced only by reducing the deep double bottoms introduced by Mr. Reed to "check rolling," erroneously, for it has the opposite effect, this has in some measure been done in the "Inflexible," or remedied by making ships unsinkable, as I pointed out in my lecture on the loss of the "Captain" in 1872, page 30. This has in part been attempted in the "Inflexible," by cork and other devices, while there is nothing of the kind in Mr. Reed's designs. So with equal accuracy of five vessels of Mr. Reed's design with meta-centric heights of 2·2 or 2·4 or even 3 feet, without clothing, or only 4 or 5 inches thick, would fail, while the "Inflexible" would practically be still safe.

It must be a subject of congratulation that the theory that for "a vessel to be *safe she must have very little initial stability*," has been abandoned; for besides the damage entailed on many ships of the Navy, it had found its way into the Merchant Service, and had occasioned the foundering of several vessels and the loss of some of their crews.—E. G. F.



## Ebening Meeting.

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Monday, February 4, 1878.

LIEUTENANT-GENERAL SIR JOHN H. LEFROY, R.A., K.C.M.G.,  
C.B., F.R.S., in the Chair.

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### ON COMPASS ADJUSTMENT IN IRON SHIPS, AND ON A NEW SOUNDING APPARATUS.

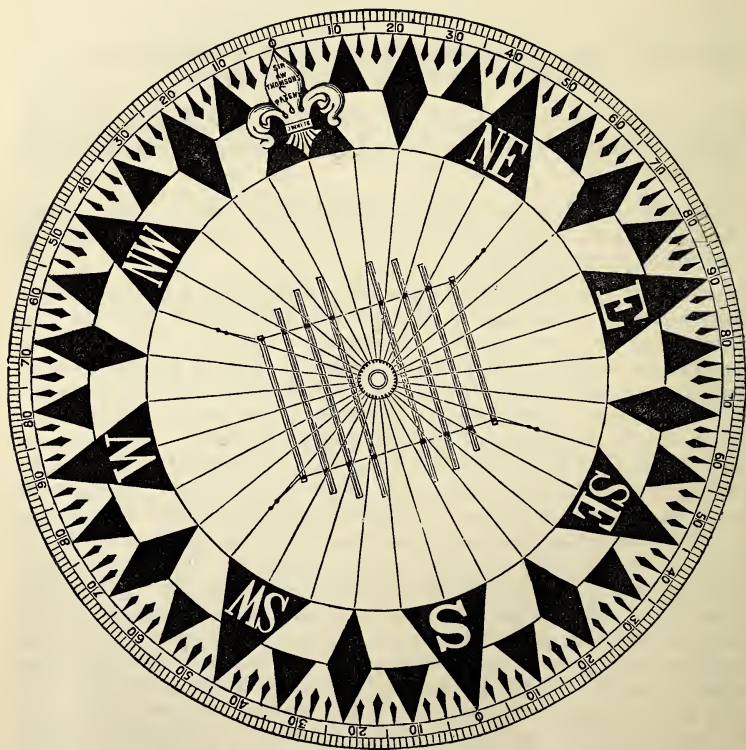
By SIR WM. THOMSON, LL.D., F.R.S., Pres. R.S.E., Professor of  
Natural Philosophy in the University of Glasgow, and Fellow of  
St. Peter's College, Cambridge.

I.—*New Form of Marine Azimuth and Steering Compass with Adjuncts  
for the complete application of the Astronomer Royal's principles of  
Correction for Iron Ships.*

THIRTY-EIGHT years ago, the Astronomer Royal showed how the errors of the compass, depending on the influence experienced from the iron of the ship, may be perfectly corrected by magnets and soft iron placed in the neighbourhood of the binnacle. Partial applications of his method came immediately into use in merchant steamers; and, within the last ten years, have become universal not only in the merchant service, but in the navies of this and other countries. The compass and the binnacles before you are designed to thoroughly carry out in practical navigation, the Astronomer Royal's principles. The general drawback to the complete and accurate realisation of plans for carrying out these principles heretofore, has been the great size of the needles in the ordinary compass which renders one important part of the correction, the correction of the quadrantal error for all latitudes by masses of soft iron placed on the two sides of the binnacle, practically unattainable; and which limits, and sometimes partially vitiates the other chief part of the correction, or that which is performed by means of magnets placed in the neighbourhood of the compass. Five years ago my attention was forced to this subject through my having been called upon by the Royal Society to write a biographical sketch of the late Archibald Smith, with an account of his scientific work on the mariner's compass and ships' magnetism, and I therefore commenced to make trial compasses with much smaller needles than any previously in use; but it was only after three years of very varied



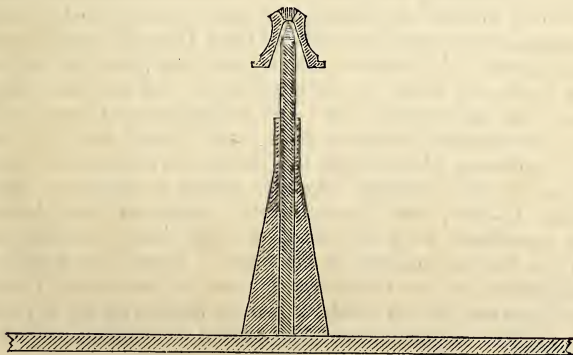
trials, in the laboratory and workshop, and at sea, that I succeeded in producing a mariner's compass with the qualities necessary for thoroughly satisfactory working in all weathers and all seas, and in every class of ship, and yet with small enough needles for the perfect application of the Astronomer Royal's method of correction for iron ships. One result at which I arrived, partly by lengthened trials at sea in my own yacht, and partly by dynamical theory analogous to that of Froude with reference to the rolling of ships, was that steadiness of the compass at sea was to be obtained not by heaviness of needles or of compass card, or of added weights, but by longness of vibrational period<sup>1</sup> of the compass, however this longness is obtained. Thus, if the addition of weight to the compass card improves it in respect to steadiness at sea, it is not because of the additional friction on the bearing point that this improvement is obtained; on the contrary, dulness of the bearing point, or too much weight upon it,



<sup>1</sup> The vibrational period, or the period (as it may be called for brevity) of a compass, is the time it takes to perform a complete vibration, to and fro, when deflected horizontally through any angle not exceeding  $30^\circ$  or  $40^\circ$ , and left to itself to vibrate freely.

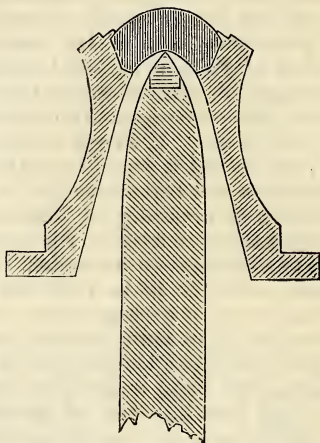
renders the compass less steady at sea, and, at the same time, less decided in showing changes of the ship's head, than it would be were the point perfectly fine and frictionless, supposing for the moment this to be possible. It is by increasing the vibrational period that the addition of weight gives steadiness to the compass; while, on the other hand, the increase of friction on the bearing point is both injurious in respect to steadiness, and detrimental in blunting it or breaking it down, and boring into the cap, and so producing sluggishness, after a short time of use, at sea. If weight were to be added to produce steadiness, the place to add it would be at the very circumference of the card. My conclusion was that no weight is in any case to be added, beyond that which is necessary for supporting the card; and that, with small enough needles to admit of the complete application of the Astronomer Royal's principles of correction, the length of period required for steadiness at sea is to be obtained, without sacrificing freedom from frictional error, by giving a large diameter to the compass card, and by throwing to its outer edge as nearly as possible the whole mass of rigid material which it must have to support it.

In the compass before you, these qualities are given by supporting the outer edge of the card on a thin rim of aluminium, and its inner parts on thirty-two silk threads or fine copper wires stretched from the rim to a small central boss of aluminium, thirty-two spokes, as it were, of the wheel. The card itself is of thin strong paper, and all the central parts of it are cut away, leaving only enough of it to show conveniently the points and degree divisions of the compass. The central boss consists of a thin disc of aluminium, with a hole in its centre, which rests on the projecting lip of a small aluminium inverted cup mounted with a sapphire cap, which rests on a fixed iridium point.



Eight small needles from  $3\frac{1}{4}$  inches to 2 inches long, made of thin steel wire, and weighing in all 54 grains, are fixed like the steps of a rope ladder on two parallel silk threads, and slung from the alumi-

nium rim, by four fine copper wires through eyes in the four ends of the outer pair of needles.



The weight of the central boss, aluminium cup, and sapphire cap, amounts in all to about five grains. It need not be more for a 24-inch than for a 10-inch compass. For the 10-inch compass the whole weight on the iridium point, including rim, card, silk threads, central boss, and needles, is about 180 grains. The limit to the diameter of the card depends upon the quantity of soft iron that can be introduced without inconvenient cumbrousness on the two sides of the binnacle to correct the quadrantal error. If, as sometimes may be advisable in the case of a steering compass, or of a pole or masthead compass, it be determined to leave the quadrantal error uncorrected, the diameter of the compass card may be anything from 12 to 24 inches, according to circumstances. A 24-inch card on the new plan will undoubtedly have less frictional error or "sluggishness" for the same degree of steadiness than any smaller size; but a 12-inch card works well even in very unfavourable circumstances, and it will rarely, if ever, be necessary to choose a larger size unless for convenience to the steersman for seeing the divisions, whether points or degrees. Specimens of 12-inch, 15-inch, and 24-inch pole compasses have been made. The last mentioned may be looked at with some curiosity as being probably the largest compass in the world. It will no doubt be properly condemned as too cumbrous for use at sea even in the largest ship, but there can be no doubt it would work well in a position in which a smaller compass would be caused to oscillate very wildly by the motion of the ship.

The period of the new 10-inch compass is in this part of the world about 40 seconds, which is more than double the period of the A card of the Admiralty standard compass, and is considerably longer than that of the ordinary 10-inch compass, so much in use in merchant

steamers. The new compass ought, therefore, according to theory, to be considerably steadier in a heavy sea than either the Admiralty compass or the ordinary 10-inch compass, and actual experience at sea has thoroughly fulfilled this promise. It has also proved very satisfactory in respect to frictional error; so much so that variations of a steamer's course of less than half a degree are shown instantly and surely, even if the engine be stopped, and the water perfectly smooth.

With the small needles of the new compass, the complete practical application of the Astronomer Royal's principles of correction is easy and sure: that is to say, correctors can be applied so that the compass shall point correctly on all points, and these correctors can be easily and surely adjusted at sea, from time to time, so as to correct the smallest discoverable error growing up, whether through change of the ship's magnetism, or of the magnetism induced by the earth, according to the changing position of the ship. To correct the quadrantal error I use a pair of solid or hollow iron globes placed on proper supports, attached to the binnacle on two sides of the compass. This mode is preferable to the usual chain boxes, because a continuous globe or spherical shell of iron is more regular in its effect than a heap of chain, and because a considerably less bulk of the continuous iron suffices to correct the same error. When in a first adjustment in a new ship, or in a new position of a compass in an old ship, the quadrantal error has been found from observation, by the ordinary practical methods, it is to be corrected by placing a pair of globes in proper positions according to the following table:—



Table for Correction of Quadrantal Error.

Distances of the Nearest Points of Globes from Centre of Compass.											
Error to be Corrected.	10-inch Globes.	9-inch Globes.	8½-inch Globes.	8-inch Globes.	7½-inch Globes.	7-inch Globes.	6½-inch Globes.	6-inch Globes.	5½-inch Globes.	5-inch Globes.	4½-inch Globes.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
i	22.80	20.52	19.38	18.24	17.10	15.96	14.82	13.68	12.54	11.40	10.26
1 ½	19.30	17.36	16.39	15.42	14.46	13.50	12.54	11.57	10.61	9.65	8.68
2	17.06	15.36	14.51	13.66	12.81	11.95	11.10	10.24	9.39	8.53	7.68
2 ½	15.48	13.94	13.16	12.39	11.61	10.84	10.07	9.29	8.52	7.74	6.97
3	14.28	12.84	12.13	11.42	10.70	9.99	9.28	8.57	7.85	7.14	6.42
3 ½	13.32	11.98	11.32	10.65	9.99	9.32	8.65	7.99	7.32	6.66	5.99
4	12.52	11.26	10.63	10.01	9.39	8.76	8.13	7.51	6.88	6.26	5.63
4 ½	11.84	10.66	10.07	9.47	8.88	8.29	7.70	7.10	6.51	5.92	5.33
5	11.26	10.13	9.57	9.01	8.45	7.88	7.32	6.75	6.19	5.63	5.07
5 ½	10.76	9.67	9.13	8.59	8.06	7.52	6.99	6.45	5.91	5.38	4.84
6	10.40	9.27	8.75	8.24	7.72	7.21	6.70	6.18	5.66	5.15	4.53
6 ½	9.90	8.91	8.41	7.92	7.42	6.93	6.44	5.94	5.44	4.95	4.46
7	9.54	8.58	8.10	7.63	7.15	6.67	6.20	5.72	5.24	4.77	4.29
7 ½	9.20	8.28	7.82	7.36	6.90	6.44	5.98	5.52	5.06	4.60	4.14
8	8.90	8.01	7.57	7.12	6.68	6.23	5.79	5.34	4.90	4.45	4.01
8 ½	8.62	7.76	7.33	6.90	6.47	6.04	5.60	5.17	4.74	4.31	3.88
9	8.36	7.53	7.11	6.69	6.27	5.86	5.44	5.02	4.60	4.18	3.76
9 ½	8.12	7.32	6.91	6.50	6.09	5.69	5.28	4.87	4.47	4.06	3.66
10	7.90	7.11	6.72	6.32	5.93	5.53	5.14	4.74	4.35	3.95	3.55
10 ½	7.70	6.93	6.54	6.16	5.77	5.39	5.00	4.62	4.23	3.85	3.46
11	7.50	6.75	6.37	6.00	5.62	5.25	4.87	4.50	4.12	3.75	3.37
11 ½	7.32	6.58	6.22	5.85	5.49	5.12	4.76	4.39	4.02	3.66	3.29
12	7.14	6.43	6.07	5.71	5.36	5.00	4.64	4.29	3.93	3.57	3.22

When the quadrantal error has been thus once accurately corrected, the correction is perfect to whatever part of the world the ship may go, and requires no adjustment at any subsequent time, except in the case of some change in the ship's iron, or of iron cargo or ballast sufficiently near the compass to introduce a sensible change in the quadrantal error. The vast simplification of the deviations of the compass effected by a perfect correction of this part of the whole error has not, as yet, been practically appreciated, because, in point of fact, this correction had rarely, if ever, in practice, been successfully made for all latitudes. The pair of large needles of the compass ordinarily used in merchant ships does not, as has been shown by Captain Evans and Archibald Smith, admit of the correction of the quadrantal error in the usual manner, without the introduction of a still more pernicious error, depending on the nearness of the ends of the needles to the masses of chain, or of soft iron of whatever kind, applied on the two sides of the compass to produce the correction. The Admiralty standard compass, with its four needles proportioned and placed according to Archibald Smith's rule, is comparatively free from this fault: but even with it, and still more with the stronger magnets of the larger compasses of merchant ships, there is another serious cause of failure depending on the magnetism induced in the iron correctors by the compass needles, in consequence of which, if the quadrantal error is accurately corrected in one latitude, it will be found over-corrected in high magnetic latitudes, and under-corrected in the neighbourhood of the magnetic equator. The new compass was specially designed to avoid both these causes of failure in the correction of the quadrantal error; and experiment has shown that, with it the correction by such moderate masses of iron as those indicated in the preceding table, is practically perfect, not only in the place of adjustment, but in all latitudes.

When once the quadrantal error has been accurately corrected, the complete application of the Astronomer Royal's principles becomes easy and sure, if the binnacle is provided with proper appliances for readjusting the magnetic correctors from time to time, whether at sea or in port. But the system of nailing magnets to the deck, in almost universal use in the merchant service, is not satisfactory, and is often even dangerous. It always renders needlessly tedious and cumbrous the process of readjustment by the adjuster in port, and it leaves the captain of the ship practically no other method of readjustment at sea than removing the magnets altogether, or taking them out of their cases, and replacing them in inverted positions. The Astronomer Royal himself pointed out that his correcting magnets should be mounted in such a manner that their distances from the compass can be gradually changed, so as always to balance the ship's magnetic force as it alters, whether by gradual loss of her original magnetism through lapse of time, or by the inductive influence of the earth's vertical magnetic force coming to zero, and then becoming reversed in direction, when a ship makes a voyage from the northern to the southern hemisphere. The not carrying out of this essential part of his plan, whether through no method or no sufficiently convenient method of adjustment having

been hitherto provided, has undoubtedly taken away much of the credit among many practical men to which the Astronomer Royal's method is justly entitled. I have, therefore, introduced into the binnacles provided for my compass, when it is to be used in iron ships, a complete system of adjustable correctors for perfectly correcting the error of the compass for every position of the ship's head when she is on even keel, and a vertical adjustable magnet below the compass, for correcting the heeling error (more properly speaking a magnet, which is vertical when the ship is on even keel, and which shares the inclination of the ship when she heels over to either side).

An objection which has often been made to the use of correctors at all, and particularly to the use of correctors for a standard compass, is that they conceal the actual state of the ship's magnetism, and that readjustment of the correctors at sea leaves the navigator without means of judging, when he returns from a foreign voyage, how much of the changed error found on readjustment in port depends on changes which have been made in the correcting magnets, and how much on changes of the ship's own magnetism. This objection I meet by providing that at any moment my correctors can be removed or set to any degrees of power to which they may have been set at any time in the course of the voyage, and again reset to their last position with perfect accuracy. The appliances for changing the adjustment are under lock and key, so that they can never be altered, except by the captain or some properly authorised officer. Farther, to facilitate the use of the correctors, I graduate the scales accurately to correspond to definite variations of the force which they produce on the compass. Thus, as soon as the error has been determined by the known method of observation at sea, the corrector may at once be altered to the proper degree to correct it. Of course the officer performing the adjustment will satisfy himself of its correctness by a second observation. The objection of "delicacy of manipulation," and the difficulty of carrying it out, except by a professional adjuster, of which so much has been said, is entirely done away with when adjustable correctors, with scales thus accurately graduated, are provided with the binnacle.

The binnacles before you are of two kinds, adapted to the two different methods given by the Astronomer Royal for correcting the semicircular part of the error; one, the square one, for correcting, by two sets of magnets, fore-and-aft and thwart-ship respectively; the other, the round one, for correcting by a single magnet, or group of bars equivalent to a single magnet, placed under the centre of the compass with its magnetic axis in the proper direction to balance the whole disturbing force on the compass due to that part of the ship's magnetism which is unchanged when she is put on different courses in the same magnetic latitude. The two sets of instructions, in the two printed pamphlets before you, explain sufficiently, for the two binnacles, the arrangements of the magnetic correctors in the two cases, and how to use them in practice.

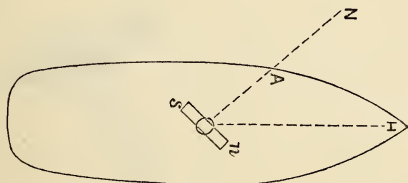
The principle in each case is easily understood. In the system employed in the square binnacle the whole constant force, due to the part of the ship's magnetism which remains constant when the ship is put



on different courses, is regarded as being replaced by three constant "component" forces, in the direction of three lines, at right angles to one another—one fore-and-aft, one thwart-ship, and the third perpendicular to the deck. The fore-and-aft component is balanced by the fore-and-aft correcting magnets, the thwart-ship component by the thwart-ship magnets, and the component perpendicular to the deck by the heeling corrector, which is a bar-magnet, adjustable to the proper height, in a line perpendicular to the deck, through the centre of the compass and of the binnacle.

In the round binnacle the component perpendicular to the deck is balanced by a heeling corrector, just as in the square one; but, instead of considering separately two components parallel to the deck, their resultant or the single component parallel to the deck, which, with the component perpendicular to the deck, constitutes the whole force, is balanced by a single magnetic force parallel to the deck. This force is obtained by turning the revolving corrector round the central axis of the binnacle and raising it or lowering it until the proper direction and proper magnitude of force are produced.

One novel feature in the last binnacle is the way in which, by aid of the guide-ring graduated to logarithmic cosecants, and the vertical scale graduated to equal proportionate differences of force, the adjustment to correct the compass on one course may be performed without disturbing its accuracy on another course on which it has been previously adjusted. The principle of this arrangement is most easily explained by aid of the mathematical notation of trigonometry, in connection with the annexed diagram, in which O represents the compass



card, A, a point of the ship, which was in the direction of the correct magnetic north, N, at the time of the first supposed adjustment, *ns*, the position of the axis of the revolving corrector set to correct the compass on that course, H the ship's head. We have (according to the notation of the instructions)—

$$\begin{aligned} HOA &= H, \\ nOH &= C; \\ \text{therefore } nOA &= H + C. \end{aligned}$$

Now the correction on the first supposed course, if it did not annul the force due to the magnetism of the ship and correctors, reduced it a force in the line OA. Hence the component perpendicular to the corrector must be kept unchanged in subsequent correction, so as not to disturb the adjustment for that first course. Let F

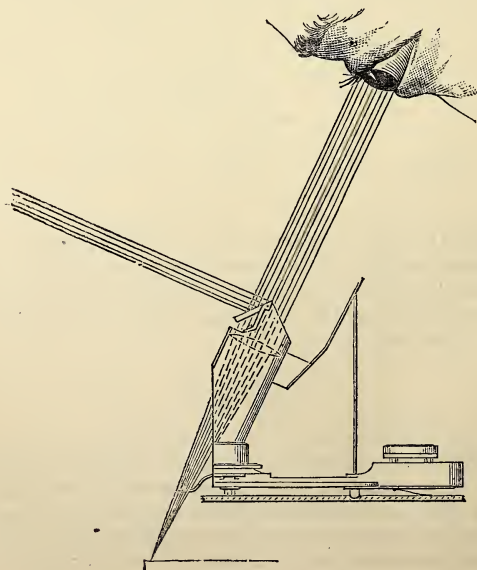


be the magnitude of the force due to the revolving corrector. Its direction being  $On$ , its component perpendicular to  $OA$  is equal to  $F \sin nOA$ . Hence, if  $F$  be increased by raising, or diminished by lowering, the corrector, the angle  $nOA$  must be altered so that  $\sin nOA$  shall vary inversely as  $F$ , or cosec  $nOA$  directly as  $F$ . In

other words,  $\frac{F}{\text{cosec } nOA}$  must be kept constant, and, therefore, the

difference between  $\log F$  and  $\log \text{cosec } nOA$  must be kept constant. When the guide-ring is placed according to Rule 2, section 4, of the Instructions, the reading upon it is the value of  $\log \text{cosec } (H + C)$ . The reading on the vertical scale is always the logarithm of  $F$ . Hence Rule 3 secures that the change of magnitude and direction of the correcting force does not vitiate the correction on the course  $H$ .

An important objection was made to me some years ago by Captain Evans against the use of quadrantal correctors in the Navy, that they would prevent the taking of bearings by the prismatic azimuth arrangement, which forms part of the Admiralty standard compass. The azimuth mirror applied to the compass before you was designed to obviate that objection. Its use even for taking bearings of objects on the horizon is not interfered with by the globes constituting the quadrantal correctors, even if their highest points rise as high as five inches above the glass of the compass-bowl. It is founded on the principle of the camera lucida. The observer when taking a bearing turns the instrument round its vertical axis until the mirror and lens are fairly opposite to the object. He then looks through the



lens at the degree divisions of the compass-card, and turns the mirror round its horizontal axis till he brings the image of the object to fall on the card. He then reads directly on the card the compass bearing of the object. Besides fulfilling the purpose for which it was originally designed, to allow bearings to be taken without impediment from the quadrantal correctors, the azimuth mirror has a great advantage in not requiring any adjustment of the instrument, such as that by which in the prism compass the hair is brought to exactly cover the object. The focal length of the lens in the azimuth mirror is about 12 per cent. longer than the radius of the circle of the compass-card, and thus, by an elementary optical principle, it follows that two objects a degree asunder on the horizon will, by their images seen in the azimuth mirror, cover a space of  $1.12^\circ$  of the divided circle of the compass-card seen through the lens. Hence, turning the azimuth instrument round its vertical axis through one degree will only alter the apparent bearing of an object on the horizon by  $.12^\circ$ . Thus it is not necessary to adjust it exactly to the direct position for the bearing of any particular object. If it be designedly put even as much as  $4^\circ$  awry on either side of the direct position, the error on the bearing would hardly amount to half a degree. If the instrument were to be used solely for taking bearings of objects on the horizon, the focal length of the lens should be made exactly equal to the radius of the circle, and thus even the small error of  $.12^\circ$  in the bearing for one degree of error in the setting would be avoided. But one of the most important uses of the azimuth instrument at sea is to correct the compass by bearings of sun or stars at altitudes of from  $0^\circ$  to  $50^\circ$  or  $60^\circ$  above the horizon. The actual focal length is chosen to suit an altitude of  $27^\circ$ , or thereabouts (this being the angle whose natural secant is 1.12). Thus if two objects whose altitudes are  $27^\circ$ , or thereabouts, and difference of azimuths  $1^\circ$ , are taken simultaneously in the azimuth mirror, their difference of bearings will be shown as one degree by the divided circle of the compass-card seen through the lens. Hence for taking the azimuth of star or sun at an altitude of  $27^\circ$ , or thereabouts, no setting of the azimuth mirror by turning round the vertical axis is necessary, except just to bring the object into the field of view, when its bearing will immediately be seen accurately shown on the divided circle of the compass-card. This is a very valuable quality for use in rough weather at sea, or when there are flying clouds which just allow a glimpse of the object, whether sun or star, to be caught, without allowing time to perform an adjustment, such as that of bringing the hair, or rather the estimated middle of the space traversed by the hair in the rolling of the ship, to coincide with the object. The same degree of error as on the horizon, but in the opposite direction, is produced by imperfect setting round the vertical axis in taking the bearing of an object at an elevation of  $38^\circ$ .

Thus for objects from the horizon up to  $38^\circ$  of altitude the error in the bearing is less than 12 per cent. of the error of the setting. For objects at a higher elevation than  $38^\circ$  the error rapidly increases; but even at  $60^\circ$  altitude the error on the bearing is a little less than half the error of the setting; and it is always easy, if desired, to make the

error of the setting less than a degree by turning the instrument so that the red point which you see below the lens, shall point within a degree of the position marked on the circle of the compass-card by the image of the object.

For taking star azimuths the azimuth mirror has the great advantage over the prism compass, with its then invisible hair, that the image of the object is thrown directly on the illuminated scale of the compass-card. The degree of illumination may be made less or more, according to faintness or brilliance of the object, by holding a binnacle lamp in the hand at a greater or less distance and letting its light shine on the portion of the compass-card circle seen through the lens. Indeed, with the azimuth mirror it is easier to take the bearing of a moderately bright star by night than of the sun by day; the star is seen as a fine point on the degree division, or between two, and it is easy to read off its position instantly by estimation to the tenth of a degree. The easiest as well as the most accurate of all, however, is the sun when bright enough and high enough above the horizon to give a good shadow on the compass-card. For this purpose is the stout silk thread which you see attached to the framework of the azimuth mirror in such a position that when the instrument is properly placed on the glass of the compass-bowl, the thread is perpendicular to the glass and through the central bearing point of the compass.

Another advantage of the azimuth mirror particularly important for taking bearings at sea when there is much motion, is that with it it is not necessary to look through a small aperture in an instrument moving with the compass-bowl, as in the ordinary prism compass, or in the original nautical azimuth compass (described 280 years ago by Gilbert, Physician in Ordinary to Queen Elizabeth, in his great Latin book, "On the Magnet and on the Earth a great Magnet"), which is very much the same as that still in use in many of the best merchant steamers. In using the azimuth mirror the eye may be placed at any distance, of from an inch or two to two or three feet, from the compass, according to convenience, and in any position, and may be moved about freely through a considerable range on either side of the line of direct vision through the lens, without at all disturbing the accuracy of the observation. This last condition is secured by the lens being fixed in such a position of the instrument that the divided circle of the compass-card is in its principal focus. Thus the virtual image of the divided circle is at an infinite distance, and the images of distant objects seen coincidently with it by reflection in the plane mirror show no shifting on it, that is to say, no parallax, when the eye is moved from the central line to either side. From the geometrical and optical principles explained previously, it follows also that if the azimuth instrument be used for taking the bearing of an object whose altitude exceeds  $27^{\circ}$ , then the effect of turning the frame carrying the lens and mirror in either direction will seem to carry the object in the same direction relatively to the degrees of the card; or in the contrary direction if the altitude is less than  $27^{\circ}$ . But if the altitude of the object be just  $27^{\circ}$ , then the azimuth instrument may be turned through many degrees on either side of the compass-card,



without sensibly altering the apparent positions of the objects on the degree-divisions.

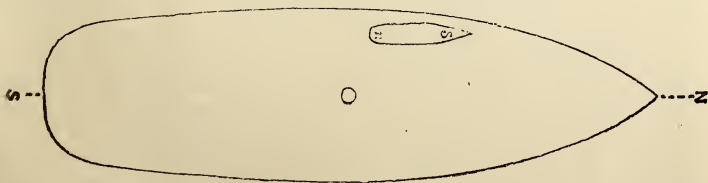
II.—*An Adjustable Deflector for completely determining the Compass Error when sights of heavenly Bodies or Compass marks on Shore are not available.*

About thirty years ago, Sir Edward Sabine gave a method, in which, by aid of deflecting magnets properly placed on projecting arms attached to the prism circle of the Admiralty standard compass, a partial determination of the error of the compass could be performed at any time, whether at sea or in harbour, without the aid of sights of heavenly bodies or compass marks on shore. The adjustable magnetic deflector before you is designed for carrying out in practice Sabine's method more rapidly and more accurately, and for extending it, by aid of Archibald Smith's theory, to the complete determination of the compass error, with the exception of the constant term "A" of the Admiralty notation, which in almost every practical case is zero, and can only have a sensible value in virtue of some very marked want of symmetry of the iron work in the neighbourhood of the compass.<sup>1</sup> When it exists it can easily be determined once for all and allowed for as if it were an index error of the compass-card, and it will, therefore, to avoid circumlocutions in the statements which follow, be either supposed to be zero or allowed for as index error.

The new method is founded on the following four principles:—

(1.) If the directive force on the compass needles be constant on all courses of the ship, the compass is correct on all courses.

<sup>1</sup> I had a curious case lately of effect of unsymmetrical iron on a midship steering compass, due to a steam-launch about 30 feet long placed fore-and-aft on the port side of the deck with its bow forward and its stern 5 or 6 feet before the thwart-ship line through the position of the compass. The compass having been adjusted by the globes and magnetic correctors to correct the quadrantal error (D), and the semi-circular error, it was found (as was expected) that the compass was correct on the east and west points, but showed equal westerly errors of about  $3\frac{1}{2}^{\circ}$  on the north and south points. There were, therefore, approximately equal negative values of "A" and "E" each  $1\frac{1}{2}^{\circ}$ . The captain was, of course, warned of the change he will find when he is relieved of the steam-launch at Rangoon, the port of his destination. The explanation of the westerly deviation when the ship's head was north or south, by the inductive magnetism of the steam-launch, according to which its stern would be a true north pole when the ship is on the north course, and a true south pole when



the ship is on the south course, is obvious from the annexed diagram, in which the letters *n*, *s*, denote true north pole and true south pole of induced magnetism in the steam-launch when the ship's head is north magnetic.



(2.) If the directive force be equal on five different courses it will be equal on all courses.

(3.) Supposing the compass to be so nearly correct or to have been so far approximately adjusted, that there is not more than eight or ten degrees of error on any course, let the directive forces be measured on two opposite courses. If these forces are equal the compass is free from semicircular error on the two courses at right angles to those on which the forces were measured; if they are unequal there is a semicircular error on the courses at right angles to those on which the forces were measured, amounting to the same fraction of the radian ( $57.3^\circ$ ) that the difference of the measured forces is of their sum.

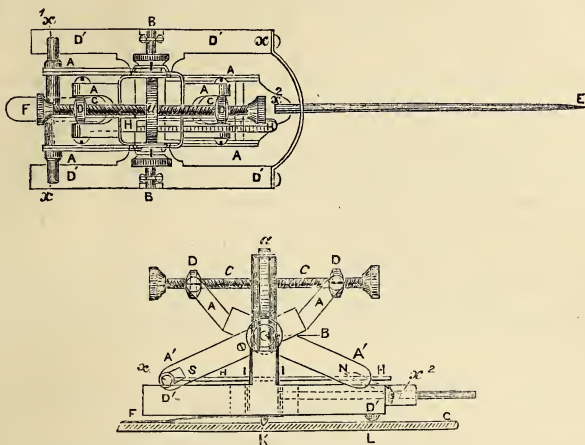
(4.) The difference of the sums of the directive forces on opposite courses in two lines at right angles to one another, divided by the sum of the four forces, is equal to the proportion which the quadrantal error, on the courses  $45^\circ$  from those on which the observations were made, bears to  $57.3^\circ$ .

The deflector may be used either under way or in swinging the ship at buoys. The whole process of correcting the compass by it is performed with the greatest ease and rapidity when under way with sea room enough to steer steadily on each course for a few minutes, and to turn rapidly from one course to another. For each operation the ship must be kept on one course for three or four minutes, if under way, by steering by aid of an auxiliary compass, otherwise by hawsers in the usual manner if swinging at buoys, or by means of steam-tugs. A variation of two or three degrees in the course during the operation will not make a third of a degree of error in the result as regards the final correction of the compass. The deflector reading is to be taken according to the detailed directions in sections 14 and 15 of the printed "Instructions." This reading may be taken direct on the small straight scale in the lower part of the instrument. The divided micrometer circle at the top is scarcely needed, as it is easy to estimate the direct reading on the straight scale to a tenth of a division, which is far more than accurate enough for all practical purposes. This reading with a proper constant added gives, in each case, the number measuring in arbitrary units the magnitude of the direct force on the compass for the particular course of the ship on which the observation is made.

The adjustment by aid of the deflector is quite as accurate as it can be by aid of compass marks or sights of sun or stars, though on a clear day at any time when the sun's altitude is less than  $40^\circ$ , or on any clear night, the adjuster will of course take advantage of sights of sun or stars, whether he helps himself also with the deflector or not.

The deflector consists of two pairs of small steel bar magnets attached to brass frames, jointed together and supported on a sole-plate, which is placed on the glass cover of the compass-bowl when the instrument is in use. The two frames carry pivoted screw nuts, with right and left handed screws. A brass shaft, with right and left handed screws cut on its two halves, works in these nuts, so that when it is turned in either direction one of the two pairs of north poles is brought nearer to, or farther from, one of the two pairs of south poles,

while the other two pairs of north and south poles are all in the line of the hinged joint between the two frames. This arrangement, which



DD, the gimballed nuts; CC, the right and left handed screws; *a*, a divided micrometer circle to aid when very minute measurement of the distance between the poles is wanted; ABA', ABA', the two frames jointed round an axis through BB of the first diagram, and perpendicular to the plane of the second diagram through its central point B; NS, the effective true north poles and true south poles; HHH, the scale indicating the distance between them; EG, the glass of the compass-bowl; K, the foot resting in the central conical hollow; L, one of the other feet; F, the spring to keep pressure on the feet LL. When the screw is turned so as to bring DD nearer one another the distance between S and N is diminished, and the axis BB rises with its ends B, B, guided by two vertical slots, of which both are seen in plane in the first figure, and one in elevation in the second figure.

constitutes, as it were, a jointed horse-shoe magnet, adjustable to greater or less magnetic moment by increasing or diminishing the distance between its poles through the action of the screw, is so supported on its sole-plate that, when this is properly placed on the glass of the compass-bowl, the effective poles move to and fro horizontally about half an inch above the glass on the two sides of a vertical plane through its centre. The sole-plate rests on three feet, one of which, under the centre of gravity of the deflector, rests in the conical hollow in the centre of the glass. It is caused to press with a small part of its whole weight on the other two feet by a brass spring attached to the bottom of the sole-plate on the other side of the centre from these two feet, and pressing downwards on the glass. A brass pointer attached to the sole-plate marks the magnetic axis of the deflector. It projects from the centre, on the side of which is the pair of true north poles. Thus, if the deflector be properly placed on the glass of the compass-bowl, with the pointer over the north point of the card, it produces no deflection, but augments the directive force on the needle.

To make an observation, the deflector is turned round in either

direction, and the north point of the card is seen to follow the pointer. The power of the deflector is adjusted by the screw, so that, when the pointer is over the east or west point of the card, the card rests balanced at some stated degree of deflection, which for the regular observation on board ship is chosen as  $85^{\circ}$ . A scale, measuring changes of distance between the effective poles of the deflector, is then read and recorded. For adjusting compass by aid of the deflector, the magnets are so placed that the deflector reading, found in the manner just described, shall be the same for the four cardinal courses; and also for one of the quadrantal courses if the compass is sufficiently affected by unsymmetrically placed iron to show any sensible amount of the "E" constituent of quadrantal error. When the deflector is to be used for determining the amount of an *uncorrected* error, according to principles (3) and (4) above, the magnetic value of its scale reading must be determined by experiment. This is very easily done on shore, by observations of its deflecting power when set by its screw to different degrees of its scale.

### III.—*New form of Marine Dipping Needle for facilitating the Correction of the Heeling Error.*

This instrument is designed as a substitute for the vibrating vertical needle, hitherto in use for carrying out the observations of vertical force, whether on board ship or on shore, required for performing the operations described in Part III, section 4, and the last three pages of Part IV of the Admiralty Manual. It consists of a light bar magnet or "needle" of hardened steel wire, supported by means of a very small aluminium cradle on a stretched platinum wire, of which the two straight parts on the two sides of the needle are, as nearly as may be, in a line through its centre of gravity. One flat end of the needle is painted white, with a black line through its middle parallel to the platinum wire. When the instrument is properly placed for use the platinum wire is horizontal, and the needle is brought into a horizontal position by turning one end of the platinum wire until the elastic force of the torsion balances the turning motive (or "couple") due to the vertical component of the magnetic force of the locality. A divided circle is used (as the torsion head of the original Coulomb's Torsion Balance) to measure the degrees of torsion to which, according to Coulomb's original discovery, the turning motive is proportional. Thus, the magnetic moment of the needle being constant, the vertical component of the magnetic force in the locality of the observation is measured simply in degrees or divisions of the torsion head. A glass plate, fixed in a vertical position parallel to the platinum wire and close to the painted end of the needle, has a horizontal score across it on the level of the platinum wire. By aid of a totally reflecting prism, like that of the prismatic azimuth compass, with one side convex, the user of the instrument looking downwards sees when the black line on the end of the needle is exactly level with the score on the glass plate. This mode of sighting has proved very satisfactory; it is very easily and quickly used, and it is so sensitive that with the dimensions and magnetic power of the instrument before you it shows easily a varia-



tion of vertical force amounting to  $\frac{1}{100}$  of the earth's vertical force in this locality. The accompanying printed instructions for the adjustment of my compass describe in sufficient detail the way of using it for correcting the heeling error.

In the instrument before you there is a divided paper circle in the bottom of the box to serve as a "dumb card," to be used with the azimuth mirror when there may be occasion for the use of a non-magnetic azimuth instrument. This appliance has nothing to do with the dipping needle, and is introduced, because while adding little or nothing to the cumbrousness of the instrument it saves the adjuster the necessity for carrying a separate azimuth instrument with him.

#### 4. *Navigational Sounding Machine.*

The machine before you<sup>1</sup> is designed for the purpose of obtaining soundings from a ship running at full speed in water of any depth not exceeding 100 or 150 fathoms. The difficulties to be overcome are twofold; first, to get the lead or sinker to the bottom; and, secondly, to get sure evidence as to the depth to which it has gone down. For practical navigation a third difficulty must also be met, and that is to bring the sinker up again, for, although in deep-sea surveys in water of more than 3,000 fathoms depth it is advisable, even when pianoforte wire is used, to leave the thirty or forty pounds sinker at the bottom, and bring back only the wire with attached instruments; it would never do in practical navigation to throw away a sinker every time a cast is taken, and the loss of a sinker, whether with or without any portion of the line, ought to be a rare occurrence in many casts. The first and third of these difficulties seem insuperable, at all events, they have not hitherto been overcome, with hemp rope for the sounding line, except for very moderate depths, and for speeds much under the full speed of a modern fast steamer. It may indeed be said to be a practical impossibility to take a sounding in 20 fathoms from a ship running at 16 knots, with the best and best-managed ordinary deep-sea lead. Taking advantage of the great strength, and the small and smooth area for resistance to motion through the water, presented by pianoforte wire, I have succeeded in overcoming all these difficulties; and with such a sounding machine as that before you the White Star liner "Britannic" (Messrs. Ismay, Imrie, and Co., Liverpool), now takes soundings regularly, running at 16 knots over the Banks of Newfoundland and in the English and Irish Channels in depths sometimes as much as 130 fathoms. In this ship, perhaps the fastest ocean-going steamer in existence, the sounding machine was carefully tried for several voyages in the hands of Captain Thompson, who succeeded perfectly in using it to advantage; and under him it was finally introduced into the service of the White Star Line.

The steel wire which I use weighs nearly  $1\frac{1}{2}$  lbs. per 100 fathoms, and bears when fresh, from 230 to 240 lbs. without breaking; its circumference is only .03 of an inch. By carefully keeping it always, when out of use, under lime water in the galvanized iron tank pre-

<sup>1</sup> It weighs 22 lbs. For diagram see page 112.



pared for the purpose, which you see before you, it is preserved quite free from rust, and, accidents excepted, this sounding line might outlive the iron plates and frames of the ship. If the sinker gets jammed in a cleft of rock at the bottom, or against the side of a boulder, the wire is inevitably lost. Such an accident must obviously be very rare indeed, and there does not seem to be any other kind of accident which is altogether inevitable by care in the use of the instrument. The main care in respect to avoidance of breakage of the wire may be stated in three words—beware of kinks. A certain amount of what I may call internal molecular wear and tear will probably occur through the wire bending round the iron guard rod which you see in the after-part of the instrument, when, in hauling in, the wire does not lead fair aft in the plane of the wheel, as is often the case even with very careful steering of the ship; but, from all we know of the elastic properties of metals, it seems that thousands of casts might be taken with the same wire before it would be sensibly weakened by internal molecular friction. Practice has altogether confirmed these theoretical anticipations so far as one year of experience can go. My sounding machine has been in regular use in charge of Captains Munro and Hedderwick in the Anchor liners “Anchoria” and “Devonia” (Messrs. Henderson Brothers, Glasgow), for twelve months and seven months respectively, and in neither ship has a fathom of wire been lost hitherto, though soundings have been taken at all hours of day and night at full speed in depths sometimes as great as 120 fathoms. No break, not explicable by a kink in the wire, has hitherto taken place in any ship provided with the sounding machine. That it will bear much rough usage is well illustrated by one incident which happened in a cast taken from the “Devonia,” running at 13 knots. The sinker in falling from the wheel into the water accidentally fell between the rudder chain and the ship, and 50 fathoms or so had gone out before it was noticed that the wire was running down vertically from the wheel instead of nearly horizontally as it ought to have been by that time. The handles were immediately applied to the sounding wheel, and it was turned round to haul in without reducing the speed of the ship. Though the wire was bent nearly at right angles round the chain until it was nearly all in, it was all got safely on board, as was also the cod-line with attached depth gauge, and the sinker at the end of it.

When soundings are being taken every hour or more frequently (as in the case of a ship feeling her way up Channel from the 100 fathom line when the position is not known with sufficient certainty by sights and chronometers) the sounding wheel should be kept on its bearings in position; with the cod-line, depth gauge, and sinker all bent on and ready for use. But in all other cases the wheel should be kept in its tank under lime water, and the cod-line with sinker and depth gauge attached should be kept at hand in a convenient place near the stand of the machine, which should be always fixed in position ready for use. With such arrangements, and methodical practice, as part of regular naval drill in the use of the sounding machine, one minute of time should suffice to take the sounding wheel out of its tank, place it on

its bearings, adjust the brake cord, bend on the cod-line, and be quite ready for a cast. When the machine is to be shown to an inspecting officer the wheel ought to be in its tank of lime water when he asks to see a cast. It should be carefully noticed that the ring at the end of the wire is securely lashed by small cord to the hole provided for it in the ring of the wheel whenever the cod-line is unbent from the ring. If the wire and ring are allowed at any time to knock about slack on the wheel when the wheel is being moved to be set up for use or to be replaced under the lime water there is a liability to some part of the wire getting a turn which may be pulled into a kink. One accident, at least, has happened in this way: the sinker dropped off carrying the cod-line and ring with it just as it was being let down from the taffrail for a cast. If the sinker had weighed 400 lbs.<sup>1</sup> it could not have broken the double wire next the ring without a kink.<sup>1</sup>

A description of the machine and rules for its use are given in the accompanying printed paper of instructions, to which I have only now to add a few words regarding the depth gauge. Erichsen's self-registering sounding lead (patented in 1836) depending on the compression of air might be used with my machine, but the simpler form before you is preferable as being surer. It too depends on the compression of air, but in it the extent to which the air has been compressed is marked directly on the interior of a straight glass tube by the chemical action of sea water on a preparation of chromate of silver with which the tube is lined internally. Between the salt of the sea water and the chromate of silver a double decomposition takes place. The chlorine leaves the sodium of the common salt and combines with the silver, while the chromic acid and oxygen leave the silver and combine with the sodium. Thus chloride of silver, white and insoluble, remains on the glass in place of the orange-coloured chromate of silver lining as far up as the water has been forced into the tube, and the chromate of sodium dissolved in the water is expelled as the air expands when the tube is brought to the surface.

My navigational sounding machine was brought into practical use for the first time in the steam-ship "Palm," belonging to Messrs. Charles Horsfall & Co., Liverpool, in a voyage to Odessa and back about a year ago, in command of Captain E. Leighton. I cannot illustrate the use of the machine better than by reading to you an extract from a letter I received last April from Captain Leighton, describing his experience of it in this first trial:—

"During the voyage in the 'Palm' steam-ship, which has just come to an end, I took frequent opportunities of testing the sounding machine when I had a chance of cross-bearings to verify the depths as shown by chart, and always found it most accurate. For instance, going up through the Archipelago and just after clearing the Zea Channel, I got a good position by bearings, chart showing 79 and 76 fathoms, two casts of your glass gave 78 and 75 fathoms. In the Bosphorus also it gave capital results in 30 to 40 fathoms water.

"The first real use I made of the machine was in the Black Sea

<sup>1</sup> See Appendix.

"during a fog which obscured everything. Wishing to make sure of my position I put the ship's head for the land, and kept the machine at work. After running in to 30 fathoms at full speed I slowed down and went in to 12 fathoms, then hauled out to a convenient depth and put her on the course up the coast. When it became clear I found myself in a proper position, and no time had been lost by stopping to sound.

"How many shipmasters let hours go by without obtaining soundings, either because of the delay or on account of the danger of rounding-to in heavy weather to get them, when, if they were provided with your sounding machine, they could have their minds set at ease by having timely warning of danger, or by knowing that they were in a good position!"

I had myself very satisfactory experience of the usefulness of the sounding machine in coming up Channel, running before a gale of south-west wind in thick weather, on the 6th and 7th of last August, on returning from Madeira in my yacht—a small sailing schooner of 126 tons. About 5 A.M. on the 6th, I took two casts, and found 98 fathoms (sand and red spots) and 101 fathoms (sand and small shells). The mean with a correction of  $2\frac{1}{2}$  fathoms to reduce to low water, according to the state of the tide at Ushant at the time, was 97 fathoms. Thenceforward I took a sounding every hour till eight in the evening. By writing these soundings on the edge of a piece of paper at distances equal according to the scale of the chart to the distances run in the intervals, with the edge of the paper always parallel to the course, according to the method of Sir James Anderson and Captain Moriarty, I had fixed accurately the line along which the vessel had sailed, and the point of it which had been reached, with only a verification by a noon latitude. At 6 o'clock next morning, by the soundings and course, with proper allowance for the flood-tide, I must have been about thirteen miles magnetic south of the Start, but nothing of the land was to be seen through the haze and rain; and with the assistance of about ten more casts of the lead (by which I was saved from passing south of St. Catherine's) I made the Needles Lighthouse right ahead, at a distance of about three miles, at 2 P.M., having had just a glimpse of the high cliffs east of Portland, but no other sight of land since leaving Madeira and Porto Santo. In the course of the 280 miles from the point where I struck the 100 fathom line, to the Needles, I took about thirty casts in depths of from 100 fathoms to 19 fathoms without once rounding-to or reducing speed; during some of the casts the speed was ten knots, and the average rate of the last 220 miles was a little over nine knots.

It is a pleasure to me to be able to add, that the sounding machine has also been successfully used in the Royal Navy. Admiral Beauchamp Seymour and Captain Lord Walter Kerr having kindly taken it on board H.M.S. "Minotaur" for trial last summer, Lord Walter Kerr wrote, on his return from Vigo, regarding it, as follows:—

"The sounding machine is most serviceable. We have been using it constantly when running up Channel, from the time of crossing the line of soundings to the time of reaching Plymouth; and, though running



“ before a gale of wind, with a heavy sea, at the rate of ten knots, we  
 “ were able to get soundings as if the ship had been at anchor. We  
 “ were able to signal to the squadron each sounding as it was obtained ;  
 “ thus, in thick weather, verifying our position by soundings without  
 “ having to round the ships to.”

### APPENDIX.

#### INSTRUCTIONS FOR THE USE OF SIR WILLIAM THOMSON'S NAVIGATIONAL SOUNDING MACHINE.

1. To prepare for sounding, the machine must be set up and securely fixed in its proper position over the stern of the vessel, the brake cord properly adjusted, the nine feet of log line bent on to the ring at the end of the wire, and the brass tube and sinker attached to the log line, according to the detailed instructions below. (Sec. 7, 8, 9).

2. *To take a Sounding.*—First, arm the sinker carefully, attending to the directions of Sec. 11 below. Then let it hang down direct from the wire wheel with one turn of the log line on the wheel. Put a glass gauge tube, open end down, into the brass guard tube, and put on the cap.

3. When ready for the cast lift the brake weight to its middle position: this releases the wheel which runs rapidly round till the sinker strikes the bottom. When the sinker touches the bottom, the wire immediately slackens and the wheel begins to stop. Watch the wire where it leaves the drum as it runs out, and when you see it slacken, immediately apply the brake to stop the wheel. Read the counter, bolt the handles, and instantly begin winding up the wire. When sounding at night, keep the light of a lamp on the wire where it leaves the drum, and watch it running out till it commences to slacken.

4. Wind in as quickly as you can, watching the sinker as it comes out of the water and the ring as it comes round the wheel. One turn of the log line round the wheel brings the brass tube to position: then stop winding; pull out the glass gauge tube, apply it (keeping closed end up) to the scale, and read off the number of fathoms shown on it by the lowest part of the red mark. This, without correction, will be the depth, accurately enough, if the barometer be at anything from  $28\frac{3}{4}$  to  $29\frac{1}{2}$  inches.

If the barometer stand at  $29\frac{3}{4}$  add one fathom in 40.

“	“	30	“	“	30.
“	“	$30\frac{1}{2}$	“	“	20.
“	“	31	“	“	15.

5. *Caution.*—In taking a cast be careful *not to lift the brake weight so high as to let the treadle rest on its lower stop.* To apply the proper resistance to the wheel to keep the wire taut when running out, *the treadle must hang free between its upper and lower stops.* If it is against the upper stop the resistance is too great and does not allow the wire to run out fast enough. If the treadle is let down so far as to touch its lower stop the resistance is too small, and there is danger of the wire shooting on and kinking when the sinker strikes the bottom. If the wire kinks in running out it is liable to be broken and certain to be damaged in being wound in.

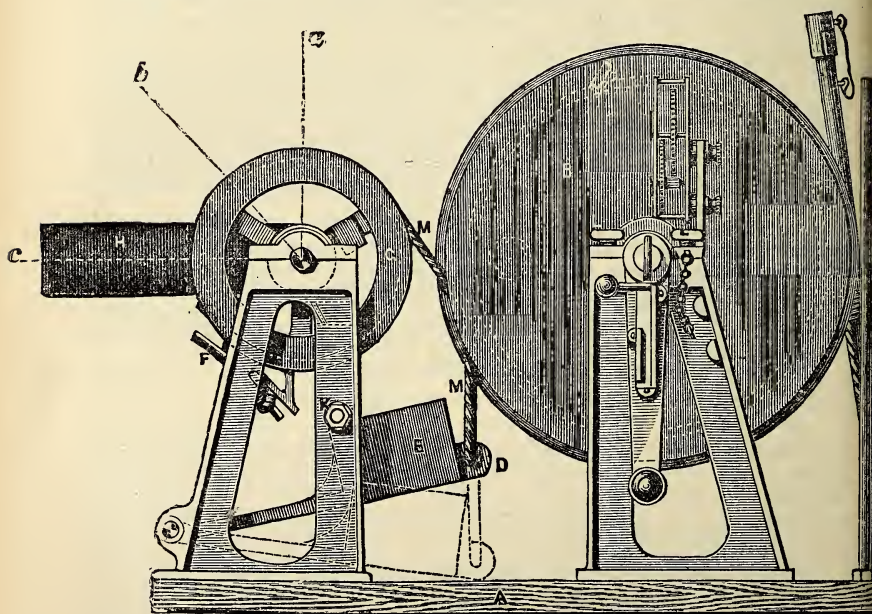
6. *Regular Use of the Machine.*—When navigating out of sight of land in less than 100 fathoms, if there is any doubt as to the ship's position, whether from the sky not being clear enough for sights or from the errors of the chronometers not being known with sufficient certainty, the sounding machine should be kept going. Two men suffice to work it whatever be the speed of the ship. It takes from a few seconds to a minute for the sinker to reach the bottom from the time it is let go, and from a quarter of a minute to four minutes for two men to haul it in, if the depth is from 10 fathoms to 100 fathoms. (One man can haul it in though the ship be running at 16 knots, but not quite so quickly nor so uniformly as two.) Thus, it is easy to take a sounding every ten minutes, with an extra hand or two to relieve. One man should guide the wire, to make it lie evenly on the drum, with a piece of canvas covered with powdered quick lime. Two men can with ease take a



sounding every quarter of an hour, and this should be the rule whenever in keeping the machine thus going useful information as to the ship's place can be had. It is not necessary to use a tube every time. The reading shown on the counter at the moment the sinker strikes the bottom allows you to judge the depth surely and accurately enough if you use a tube occasionally. The reading on the counter shows approximately the number of fathoms of wire run out.<sup>1</sup> This may be something nearly twice the depth; but the proportion of wire to depth differs according to the depth, the speed of the ship, and the roughness of the sea. For the first of a set of casts use a tube and read off the depth accurately by applying it to the scale of fathoms. After three or four more casts use another tube, and then, according to judgment, use a tube as frequently as is necessary to check your inferences of depths from the counter readings. The character of the bottom brought up on the arming of the sinker is of course to be examined every time.

*Detailed Instructions for Setting up and Adjusting the Sounding Machine.*

7. The iron stand A of the machine is bolted or lashed to the taffrail, at the stern the vessel, or to a plank or platform properly fixed to support it, so that the



sinker when ready for a cast may hang over the water direct from the wheel, clear of everything,—the wheel B, on which the wire is coiled, being placed on its supports.

<sup>1</sup> Two turns of the wheel give about a fathom of wire; but this differs a little according to the quantity of wire on the wheel, and therefore if for any purpose, as for instance taking an up-and-down cast, which may be done in 300 fathoms water or anything less, with the wire ordinarily supplied on the wheel, the counter reading must be corrected according to actual measurements of the circumference of the wire-wheel when the sinker is at the bottom, and when the wire is wound on again.

8. The brake is to be adjusted as follows:—The rope MM securely knotted at one end is passed through the hole D in the end of the treadle E, then straight up and round the groove on the wire wheel B, and thence round the brake wheel G to the cleat F, where it is to be belayed. Before belaying it raise the weight H to the highest position shown by the dotted line at *a*, then pull the brake rope so taut that the end of the treadle E may just rest on the stand, and belay it so on the cleat.<sup>1</sup> With the brake in this position there is little or no resistance applied to the drum. Now allow the weight H to fall to its lowest position as shown by the dotted line at *c*, and the maximum resistance will be applied to the drum: this will suffice to prevent the wire from running out when the sinker is hanging over the stern. Lift now the weight H from its lowest and hold it in its middle position, shown by the dotted line at *b*: the treadle thus brought to hang free pulls the brake cord with a force of about 7 lbs., and produces a resistance to the wire running out equal to about 5 lbs.

9. Put the handles on, and screw up the pins in the side of the handles. The pins working in the grooves in the spindles prevent the handles from falling off. While the wire is running out, the bolts in the handles are withdrawn to allow the drum to revolve without carrying the handles with it.

10. *The Sinker* is a galvanized iron weight about 3 ft. 3 in. long, weighing about 22 lbs., with a hollow in its lower end to receive the usual arming of tallow, &c. It is attached to one end of a length of 9 feet of log line of which the other end is bent on to the ring at the end of the wire; one of the brass tubes *c* is lashed to this rope, as shown in the drawing, with its top end 3 feet from the ring.

11. When a cast is to be taken the hollow in the sinker is armed with tallow in the usual manner. It is advisable also to coat the sinker all round its lower end for about half an inch up the side with the tallow, so that if the edge should strike the bottom a specimen may still be obtained.

12. One of the prepared glass gauge tubes with its open end down is placed inside the brass tube, and the cap is put on the brass tube.

13. When, in taking a cast (Sec. 3 above) the weight H on the brake wheel is held by the hand in the position *b* shown on the drawing intermediate between the upper and lower positions, the end of the treadle E hangs from the cord M between the upper stop K and the base A, and, as stated above, pulls on the cord with a force of about 7 lbs., by which a resistance of about 5 lbs. is opposed to the wire while it is running out. This constant retarding force of about 5 lbs. stops the drum when, on the sinker striking the bottom, the wire ceases to pull with a force equal to it. When the wheel is seen to stop (Sec. 3), the weight H on the brake wheel is allowed to fall to the position *c*, whereby the full power of the brake is applied to the drum and prevents any more wire from running out. When the handles are applied to re-coil the wire on to the drum, the first effect of winding back the wheel is to lift the weight H on the brake wheel to its highest position. Thus the retarding force of the brake cord against the continued motion of the drum in hauling in is almost entirely removed. To entirely remove the brake resistance during a long haul, one of the men may hold up the weight H in its highest position.

14. When the machine is not required for immediate use unbend the log line from the ring. Lash the ring securely by small cord, passed through the hole in the rim of the wheel, to keep the wire firm on the wheel: take the wheel off its bearings and keep it in its galvanized iron tank covered with lime water to prevent the wire from rusting. The water may be kept constantly in the tank, and occasionally a lump of burnt lime dropped on the upper side of the wheel as it lies in the tank to keep the lime solution up to full strength.

15. One hundred prepared gauge tubes are supplied in a metal case with double sides. The space between the two sides can be filled with sea water, to allow of the tubes being kept at nearly the same temperature as the sea. If the temperature of the air in the gauge tubes is different from the temperature of the sea the results will be slightly vitiated. In preparing to take soundings in hot or sunny weather, the outer case should be filled with sea water which should be changed occasionally to bring the tubes nearly to the temperature of the sea before they are used.

<sup>1</sup> The brake cord must be occasionally tightened again on the cleat according to this rule, when it is found to have slackened by stretching in use.

*List of Articles Supplied with the Sounding Machine.*

The wire drum, with 300 fathoms of wire, and two handles.

Galvanized iron tank, in which the wire drum is to be kept covered with lime water when not in use.

Counter for showing the amount of wire out.

Four galvanized iron sinkers.

Four brass tubes.

Four galvanized iron rings.

One metal case, containing 100 prepared glass tubes.

Two fathom-rules.

Quick lime.

The CHAIRMAN: We have the pleasure of seeing in the audience several gentlemen of great experience in nautical observations. I trust some of them will favour us with remarks. Perhaps the Hydrographer of the Navy will favour us with his views.

Captain EVANS, R.N., C.B., Hydrographer to the Admiralty: I did not wish to speak, but being named by the Chairman, a few words may, perhaps, interest the meeting. There is no doubt that any instrument, especially a compass, brought forward by Sir William Thomson, will be thoroughly perfect in all its theoretical details. I have followed Sir William Thomson in the progress of this instrument to its present state; I know how he commenced the investigations relating to its construction, and it may be considered certain that every point he has brought forward to-night is theoretically correct. He has placed before you a compass, which, if the intelligence throughout the nautical profession came up to Sir William Thomson's standard, then, possibly, it could be used with perfect confidence. But that is the point; have seamen, as a rule, the intelligence to handle those delicate magnets which he applies? I am glad of one thing that he has done in this compass. He has brought forward, in a marked way, the advantages of small needles. That is a matter, the necessity of abolishing the use of long needles, which I have been long endeavouring to instil into seamen's minds. The idea of large compasses came in with large ships, but it was a great mistake: Sir William Thomson has worked to secure theoretically the most perfect compass, knowing that long needles were radically wrong in practice. It results that the compass we see before us requires management, differing entirely in system—not from that of the merchant service, for there there is no system—but from that organized in the Royal Navy. It is somewhat curious, that notwithstanding the several points of this instrument which I have stated as being theoretically accurate, its details should differ from those adopted in practice in the Navy. Those who have gone into the question, and know by experience what a dangerous instrument a magnet is to put in the hands of an unskilled seaman, hold it as a cardinal maxim the non-employment of movable magnets. In the Navy the custom is to determine experimentally the magnetic character of the ship, and that, I would observe, is a very important point:—every iron ship has a constitution of its own, much as a human being; and before a compass can be effectively applied in the iron ship (for the deviations of course are different in every part of her) you must know the magnetic constitution of the individual ship. Well, it may be considered strange, but there are, perhaps, not twenty men in Europe who have gone thoroughly into that special branch of the subject, the magnetic constitution of the ship. When that constitution is known, we see not only the advantages, but the security of permanently fixed magnets; you further then insist upon the principle that the seaman is not to consider that his compass is perfect in its pointing; he must always consider it imperfect. Sir William Thomson strives—which is a fine idea—to have a perfect compass. If the seaman has the technical knowledge to make it, by the use of the appliances, a perfect compass, well and good, but until he has that knowledge, I venture to think it should have trial in the hands of ordinary seamen, say in the merchant service, before it can be pronounced to have, although theoretically a beautiful and perfect



compass, all the practical advantages demanded for service afloat. Sir William Thomson dwelt for some time upon the quadrantal deviation; in aiming to do away with, or rather to neutralize this deviation, he has brought about all these beautiful devices. The quadrantal deviation, however, is not a very formidable error under ordinary circumstances, either in merchant ships or at the standard compass position in ships of war. This deviation further does not change on the ship proceeding to any part of the world, and it thus becomes a check upon compass observations made by the navigator. If a deviation table has not been constructed with proper care, we can apply this test of the quadrantal amount, to see where the errors exist. Supposing the compass before us was introduced generally, there will be this difference between the two systems of management: in the one you must know the magnetic constitution of the ship, then adjust your magnets permanently, and observe the errors constantly. In Sir William Thomson's compass you need not know the ship's constitution, but must trust, day by day, to your technical knowledge and skill in utilizing these delicate adjustments. Therefore, it appears to me to come to this—theoretically, Sir William Thomson gives you something approaching to perfection; but practically, you are brought up by the performance of details, which demand far more intelligence and knowledge than we know to exist among seamen. A practically accurate and reliable system of compass management is a very complicated, and, to some extent, an abstruse question, and there is far more in it than lies upon the mere surface of a compass as you see it in ordinary action. An Officer will say, "Oh, that is a beautiful compass, as steady as possible; never had a 'better.'" These opinions are not worth much unless we know all the conditions on which the judgment has been given. Some Officers consider the same compass should be good in a gale of wind, and should be equally steady under concussion when firing broadside guns, that almost shake the teeth out of men's heads: that it should be equally reliable when the ship is steaming along steadily, or when she is going at high rates of speed: they think, in short, the same individual compass should be efficient under all these varying conditions. It is an impossibility; you must have a difference of arrangement in the compass to meet these various conditions. Sir William Thomson has brought proof of the periods of oscillation being so much in favour of his very small and delicate needles. I believe all this to be perfectly sound in theory, but the question is, how will such delicate arrangements answer in practice for active and prolonged service afloat? These are the chief points which present themselves for consideration.

The CHAIRMAN: I think we have Mr. Siemens here—we shall be very glad if he will offer any observations upon the subject of Sir William Thomson's sounding apparatus. The inventor of the bathometer, one of the most remarkable applications of science in our day, cannot fail to take an interest in other means of sounding to great depths.

DR. SIEMENS, F.R.S.: I did not intend to trouble you and the meeting with any observations of mine. The beautiful instrument Sir William Thomson has brought before us is entirely different in its principle from the attempt I have made to ascertain the depth, without material contact between the bottom of the sea and the ship. That problem is one which I am following up with considerable interest in my leisure hours, but the instrument which Sir William Thomson has brought before us is one that has already received the sanction of practice. It is one which is, I believe, of great value to the navigator, because it gives him the means of ascertaining the depth below the ship in shallow seas, without stopping the ship. With the ordinary sounding line, as we all know, if the depth exceeds five or six fathoms, the ship has to stop to take soundings. Sir William Thomson, with his beautifully adjusted wheel and his sounding wire, is able to reach the bottom without stopping the ship in its motion, and he receives a record of the hydrostatic pressure at the bottom of the sea in a tube, sealed at one end and covered with a chemical preparation on its inner surface, which is turned white, as we have seen, to the point to which the sea water penetrates in compressing the air before it. He thus brings to light the record of the pressure, and with it the record of the depth below the ship, and, as he has explained, is able to approach land in the time of dense fog, feeling his way, as it were, on the bottom by this beautiful machine. My own instrument, the bathometer to which you alluded, will be applicable chiefly for the guidance of the navigator as to his position when he has passed from the



ordinary soundings to deep-sea soundings, which could not be accomplished even with Sir William Thomson's wire without stopping the ship and without considerable loss of time. I hope that both Sir William Thomson's and my own instruments will ultimately prove of real service to the navigator.

Admiral RYDER: Would Sir William Thomson tell us how many of the tubes he proposes each ship shall be supplied with before she goes out on a three years' commission?

Sir WILLIAM THOMSON: About 500 tubes.

The CHAIRMAN: I have been very much interested in the remarks that dropped both from the Hydrographer and Sir William Thomson with regard to eliminating from compasses that which is a part of them as they are matter, but not a part of them as they are magnetized matter, namely, their inertia. Many years ago it fell to my lot to make observations on the motions of magnetic bars varying from two feet to three inches in length, and it was curious to find that when there were no circumstances affecting them to throw them into agitation their positions agreed; but the moment the heavy bar got a swing upon it, it became wild, the oscillations overran one another, and there was little correspondence between their motions and those of the lighter magnets. That is true of every compass, whether it weighs as many grains as Sir William Thomson's compass or as many ounces as they formerly did. On that point I was very much struck by what has been said. The only part which I confess I feel unable to follow him in, is with regard to the magnetic inclination which is to be determined by some balance of torsion. However, it is difficult, I believe, to see such a subject clearly without an instrument in our hands. Perhaps Sir William when he comes to reply will throw a little more light upon that part of his subject.

Staff-Commander HULL, R.N.: There has been a difficulty, I believe with Sir William Thomson's compass, in some experiments made in the "Minotaur" during the firing of her large guns, and from a report which has reached me I believe his compass has not done so well as the Admiralty compasses under the same circumstances. Perhaps Sir William Thomson, who I think also knows something of this, would give us some idea how he proposes to place his compass on a level with the Admiralty compasses, the action of these large guns being considered.

Captain LONG, R.N.: I think, Sir, as no one appears to have had any experience of Sir William Thomson's compass, I should like to inform the meeting I had the pleasure of going across the Atlantic the other day steered by one of these compasses, which was placed just abaft the iron mast, and the Captain told me it was the only compass he had ever had which could be used in that position. It so happened the position of the wheelhouse was very close to an iron mast, and this compass was used all the way across with great success. It was on the White Star steamer "Germanic," and she averaged 14 knots the whole way.

The CHAIRMAN: I think Captain Maclear can tell us something of the application of Sir William Thomson's sounding machine; if I am not mistaken, the "Challenger" was provided with it. At all events, I am sure Captain Maclear can give a valuable opinion upon this, as he can upon any other subject embraced by the duties of a scientific Officer.

Captain MACLEAR: I have a few words to say about the sounding machine in the "Challenger." It was proposed at one time to use Sir William Thomson's sounding machine, and we were provided with the original wheel that he made, and with his wire. Sir William had been good enough to show it and to explain the working of it to me at the meeting of the British Association at Brighton in 1872 before we left. One great thing that determined that we should not use it on board was that we required in the "Challenger," not only to find out the depth, but also to send down water bottles, several thermometers, pressure gauges, and other instruments, making a very heavy weight and of great value. I mean not only their intrinsic value, but their value as instruments whose errors had been determined. There is one very great fault with wire used as sounding-line, that is, if it takes a kink anywhere, catches under the keel, or gets a nip anywhere, it parts instantly; and Captain Nares after consideration determined that it was far too great a risk to run with the instruments to chance the loss of so many of them by a nip of the wire. If we were sounding simply for depth it would matter little, because we could carry

a great number of wires ; but when we have a great number of instruments depending on this line it becomes a matter of great moment that we should recover them. We cannot carry an unlimited supply of valuable instruments. That was what determined the disuse, and the best hemp was used instead. I know the wire has many advantages over hemp in sounding, but there is this very serious disadvantage, that it will not stand a sudden jerk, and it will not stand a nip, and if you are working in very great depth where the sounding has to occupy some time, not minutes, but perhaps half an hour, or an hour, or more than that, and in different sorts of weather, it is hardly possible to avoid sometime or other getting the line under the keel or making a sharp angle somewhere, and then on the first motion of the ship the line and everything else is gone. That is the only disadvantage that I know of. It is of very great value for ordinary sounding ; but in the case in point in the voyage of the "Challenger" that is what prevented its use. I would also mention the difficulty of attaching thermometers to the wire at different depths.

Sir WILLIAM THOMSON in reply said : Captain Evans stated that it was his rule to admit no movable magnetic correctors. I cannot admit the practicability of that rule. As a matter of fact it is not, and cannot be carried out in practice. The magnets used to correct the compass must be movable, and are movable by irregular, if not by regular, means in every ship. For many short voyages, and even for voyages from Glasgow or Liverpool to New York and back, it may be generally advisable not to alter the correcting magnets in the course of the voyage. But if a ship goes to the southern hemisphere, it is frequently found that error grows up to a very inconveniently great degree in a compass which was correct when leaving England, and it sometimes happens that the magnets are found to be increasing the error instead of diminishing it. In such cases, unless provided with some regular means of moving or changing the correcting magnets, the navigator has no resource but to tear one or more of them off the deck when the system of fore-and-aft and thwart-ship magnets nailed to the deck is adopted ; or, with a screw-driver, to take off the brass cap from the hole in the teak column in which the single magnet of the Admiralty system is placed, and remove or invert the magnet. I thoroughly see the importance of taking every security against any tampering with the magnets, and therefore in my binnacle I put them under lock and key, which is surely a better security than a lead cover nailed to the deck over the magnets, or a brass plate on the side of the binnacle removable by a screw-driver. Suppose it is ordered that during a particular voyage, or for a certain time, the magnets shall not be altered—the binnacle is locked and the key is put into the hands of a responsible Officer. In merchant ships of the better class, and in the Royal Navy, the management of the compass is safe in the hands of the Captains and navigating Officers ; with discretion, in accordance with definite general instructions, to change the correctors gradually according to observations made at sea or in harbour from time to time : but whether the magnets are to be changed by the Officers of the ship when change is needed, or only by professional adjusters coming on board occasionally, the system of keeping them under lock and key in the binnacle gives much more security against any accidental or unauthorised disturbance than the systems hitherto in use, whether in the Royal Navy or in merchant ships.

Captain Evans has done ample justice to the instruments and methods before you in saying that they are theoretically perfect ; but if they are not also suitable for practical work they have no right to be here, nor to be admitted on board ship. The Admiralty Manual, by Captain Evans and Mr. Archibald Smith, is perfect in theory ; it gives the theory of the effect of ship's magnetism upon the compass most admirably ; I believe as well as it can be given. I have only endeavoured very humbly to put in practice some of the theoretical conclusions to be found in the Admiralty Manual.

I read<sup>1</sup> in it, with reference to the quadrantal error, "the correction made by the soft iron correctors is not affected by any change of magnetic latitude of the ship, and when once made should remain perfect at all times." Then I say it ought to be corrected both for the standard and the steering compass of every ship, and I do not think the Admiralty system, according to which "the quadrantal deviation is not

<sup>1</sup> Admiralty Manual, Part IV, Page 95. Edition 1874.

"often corrected mechanically, but is generally left for tabular corrections,"<sup>1</sup> can be defended as a good practical rule.

The correction of the quadrantal error by the Astronomer Royal's method vastly simplifies the compass problem for the navigator, and diminishes the risk of mistake. It will also very considerably diminish the labour, in the Compass Department, of performing the analysis, according to Archibald Smith's method, by which the accuracy of the observations which have been made at sea is checked, and the magnetic history of the ship recorded.

Captain Evans remarked that it is expecting too much of a compass to expect that it shall be convenient for all uses; that the same compass shall be not only accurate as an instrument of navigation in smooth water and in a steady ship going at a moderate speed, but that it shall work well at full speed trials, in gun practice, and in a heavy sea. I quite feel that that is, perhaps, expecting too much; but if, as I hope may be the case, it turns out that these expectations can be realised, then it may be admitted that the attempt to realise them was not visionary or impractical. The compass before you (besides being adapted, which was its primary object, to admit of the perfect correction of the quadrantal error) has been amply proved by experience to fulfil two of these other four conditions, to which Captain Evans has referred; it is not only accurate as an instrument of navigation in favourable circumstances, but it has been found to be very remarkably steady in the heaviest sea. It may oscillate through two or three degrees when the ship is rolling so much that one of the ten-inch compasses of the merchant service oscillates through ten or twelve degrees, and the Admiralty standard compass in the same circumstances as much as twenty degrees. [*Addition.* In such circumstances the Admiralty rule<sup>2</sup> is to substitute the heavy J card for the A card. The result cannot but be unsatisfactory, as must be every attempt to overcome unsteadiness by increased friction on the bearing point.] As to unsteadiness of the compass in a position in which there is great vibration on account of the screw propeller, or any other part of the machinery in the ship, the ultimate remedy in extreme cases it seems must be elastic suspension, but the peculiar mode of connection, by silk threads, between the rim and the central cap, and the needles, seems to give the compass before you considerable advantage in this respect over compasses of the ordinary form. Out of about 150 which have been sent to sea within the last 14 months, four only have been complained of as having shown unsteadiness on account of the tremors of the ship.

In one of these instances (the steamer "North Eastern," plying between Ardrossan and Belfast) the fault was completely corrected by substituting another bowl more heavily weighted with lead, and with a little more castor oil in the double bottom; and the compass has been found to have been remarkably steady, and to have worked in a perfectly satisfactory manner during six months since the change was made. It may be fairly expected that, if not by so simple a remedy as this, at all events by proper elastic suspension, the unsteadiness will be perfectly overcome in the other three cases. The behaviour of my compass under gun-fire hitherto has not been altogether satisfactory, although it was at first very promising; and I still trust it is not going to ultimately disappoint the most sanguine expectations. It was tried by kind permission of Captain Grant during a day's gun practice on board H.M.S. "Flirt" in the Frith of Clyde, in the autumn of 1876, and again on board H.M.S. "Gorgon" off Plymouth, by kind permission of Admiral Sir Thomas Symonds; and on both of those trials its behaviour was most thoroughly satisfactory. The card never moved more than four or five degrees on the occasion of any single discharge or of a broadside of the "Gorgon's" 18-ton guns, and often not perceptibly, or not more than a degree or two, when other compasses were set into violent oscillation, and sometimes sent flying quite round. From the German Admiralty I have an official report regarding one of my compasses, used as steering compass on board the ironclad "Deutschland," of the German Imperial Navy, to the effect that it was exceedingly steady whether in rough water or smooth, and notwithstanding violent agitation produced by a machine for lifting ashes from the

<sup>1</sup> Admiralty Manual. Part IV, Page 90.

<sup>2</sup> *Ibid.* Edition 1874. Page 184.



furnace under the bridge on which the compass was placed, and that the only exception to its steadiness was during gun practice, when it was sometimes set into considerable oscillation.

In answer to the Chairman I may explain that the determination of the "dip" or "magnetic inclination" though not the immediate object of the new form of dipping needle which I have brought before the Institution, can be performed at sea by combining observations taken by its aid, with proper observations for measuring the horizontal force.

In answer to Captain Hull's question, I may say that by an unofficial report from H.M.S. "Minotaur," I learn that during gun practice the cap of my compass was thrown off the bearing-point, so that for the time the compass was disabled. No damage however was done, and a temporary guard to prevent a similar accident from occurring again, has been applied to the roof of the compass bowl. No such accident had ever happened before, but the liability of its possibly happening having been proved by the experience of the "Minotaur's," I have added a guard of a permanent character which will be applied to every compass bowl designed for use in ships of war in future (and probably also for merchant ships, as at all events it does not in any way impair the efficiency and convenience of the compass for ordinary use, and it may in some rare cases be useful). With this and with a proper elastic suspension I have every hope of being able to render my compass continuously available for the navigation of the ship in every contingency of gun practice.

Returning to the subject of compass correction. The correction of the quadrantal error, though admittedly possible with my compass, has been spoken of by Captain Evans as not very important. Now, considering that the quadrantal error is scarcely ever less than six degrees, and is often as much as nine or ten degrees in merchant steamers, and in the standard compasses of modern war ships, I think the practical value of a complete correction of this error is very clear. For the same amount of maximum error, the quadrantal error changes twice as rapidly as does the semicircular error, and therefore a quadrantal error of eight or ten degrees is much more embarrassing than a semicircular error of the same amount. A quadrantal error of ten degrees implies a change in the error of the compass amounting to as much as half a point with so small a change as a point and a half in the ship's course from one side to the other of any of the four cardinal courses.

I wish, in conclusion, to express the strong feeling of admiration I have for the thorough system of analysis conducted for many years by Captain Evans, and continued by his successor in the Compass Department, Captain Mayes, by which all the observations reported to the Department by the Navigating Officers of the Royal Navy are rendered available for obtaining and keeping on record a knowledge of the magnetic history of every ship, and to express my cordial appreciation of the Admiralty Manual, due to Captain Evans and Archibald Smith, which has been and is the guide not only for the British Navy but for the navies of the world, and for every sailor or landsman who has endeavoured to make himself acquainted with the theory and practice of compass correction in iron ships.

THE CHAIRMAN: At this late hour nothing remains for me to do except to convey the thanks of the United Service Institution to Sir William Thomson for the very able lecture that he has given us. The Institution must feel honoured when scientific men of the highest rank come before us, who may in some sense claim to be experts in this matter. I do not, of course, refer to myself, but to a large number of Officers round me, experts in whatever relates to observations at sea, and whose experience embraces conditions which can scarcely be realized artificially. Sir William has brought this subject before us with a degree, if he will permit me to say so, of modesty, which I think is not less admirable than the clearness and lucidity with which he explained his views. I am sure you will all very heartily join in expressing our thanks to him for his extremely interesting lecture.



# LECTURE.

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Friday, 18th January, 1878.

MAJOR-GENERAL SIR GARNET WOLSELEY, K.C.B, G.C.M.G.,  
&c., &c., in the Chair.

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## ON MILITARY EQUIPMENT.

By Lieutenant F. J. GRAVES, 20th Hussars.

THE question of Military Equipment has for some time past been occupying considerable attention, not only among military authorities, but among many classes of civilians. It is generally felt that as war is a progressive science, so the various implements and articles of equipment pertaining to it must necessarily be of such a character as will in the best possible manner fulfil the various needs of war as they arise. Change, then, becomes necessary; but changes may be made without sufficient ground, and simply for the sake of change. I can only hope, however, that such changes as may be proposed in this lecture will be found to have a good basis of fact, and the opinions of great men founded on fact to support them.

With regard to the dress, &c., of Officers, an opinion is gaining ground that we want more simple dress for actual work; that gold belts and silver pouches would be advantageously replaced by white belts and cases, with compass and field-glass, together with brown leather sword-belts, &c. But to take a wider field. I propose to deal shortly with a few, and only a few, points, touching the equipment of artillery, infantry, and cavalry, from the standpoints of utility, the comfort of the soldier, and economy both to the State and the individual. I cannot pretend to exhaust this large and important subject in one lecture, and, indeed, I cannot lay claim to the knowledge required to do so, even if I had that important element, time, completely at my disposal.

With your kind permission, then, I will proceed to the consideration of the equipment of artillery, the term "equipment" to include all articles required for the use of the soldier.

### *Artillery.*

My remarks upon this branch of the Service must necessarily be brief, first, because the most important part of its equipment, namely,

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Fig 4.

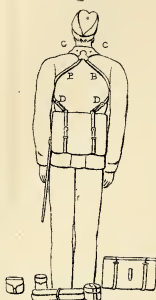


Fig 5.

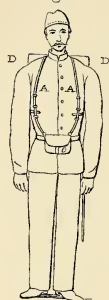


Fig 1

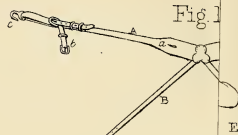


Fig 2

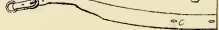


Fig 3

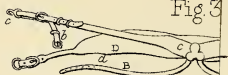


Fig 15.



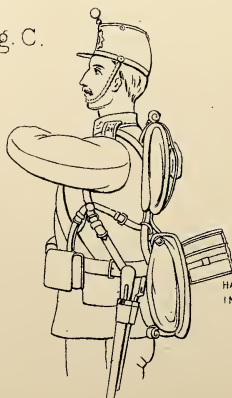
Fig A.



Fig



Fig. C.



FOR TEMPORARY CARRIA

HANDLE AND BAYONET  
IN ONE FROG









Fig. 1.

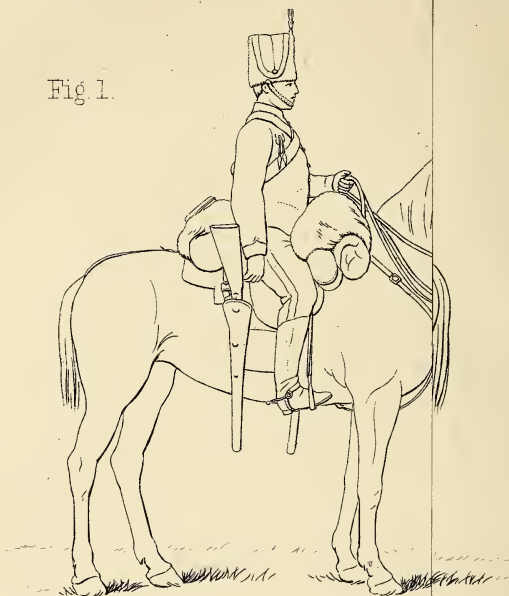
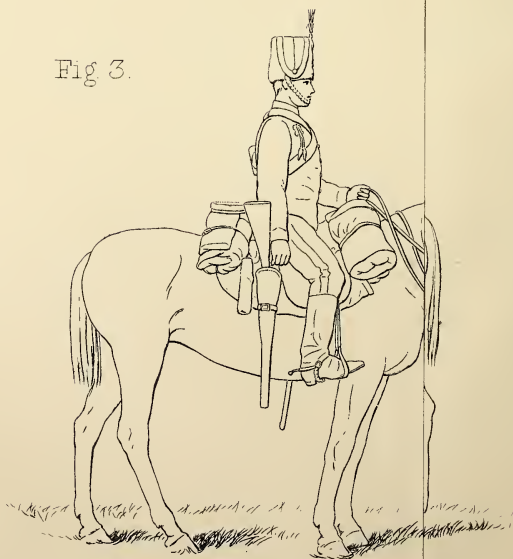


Fig 3.



the gun, demands an amount of technical knowledge which I do not possess; secondly, because the remarks concerning several articles of artillery equipment, &c., apply equally to that of the other branches of the Service under consideration to-day.

Much attention has been given within the last few years to the subject of the equipment for the supply of ammunition in the field; and, with a view to improvement in this direction, Major W. Ellis, R.A., while proposing to raise the number of guns attached to an infantry division from 18 to 24, and also that no guns shall belong permanently to the cavalry brigade, but that a brigade of 48 horse artillery guns shall be formed, from which guns shall be detached as required, suggests that the equipment for the supply of ammunition shall be materially altered. He proposes that the ammunition waggon in present use shall be replaced by two limbers, carrying together the same amount of ammunition as the waggon, and requiring no more horses than the waggon, namely, six; the first line of limbers to be drawn by four horses, which would keep up with the guns in action; the second line to be drawn by two horses, and to move as a rule at a walk. The weight of a waggon loaded is 40 cwt. 0 qrs. 2 lbs., whereas Major Ellis's limbers each weigh, when packed, 18 cwt., or, taken together, upwards of 4 cwt. less than the loaded waggon. Each horse in the service waggon carries or draws 747 lbs., whereas in the 4-horsed limber, each horse would carry 504 lbs., but in the 2-horsed limber each horse, would carry 1,008 lbs. The question among others to be solved is, whether or not this latter weight is excessive when moving as a rule at a walk. I am inclined to think not. Should Major Ellis's proposal be adopted, there would be greatly increased mobility, a more easy and rapid supply of ammunition in the field, and last, but not least, the adoption of such an alteration would be acting out the commonplace, yet common sense proverb that "It is better not to carry all our eggs in one basket." When we consider the tremendous moral effect produced by a concentrated, well directed, and rapidly delivered artillery fire, directed and delivered in such a manner as, I am led to believe, on the authority of the latest experiments, only our British gunners can effect; when, moreover, we consider that Germany had 4 to 5 guns per 1,000 men in the army corps in their last war, and that Russia deems it necessary to have 4 guns to every 1,000 bayonets and 8 to every 1,000 cavalry; and when we consider that the adoption of Major Ellis's proposals (and I have by no means exhausted them) would raise our proportion to 3 guns per 1,000 bayonets, or 4 per 1,000 men in an army corps; when, I say, we consider these points, and the issues dependent on their right solution, I am sure I am not exceeding when I say that the subject of the equipment for the supply of ammunition in the field is a most important one, and demands a searching and extended investigation and an early settlement.

A few words with regard to the fire-arms, &c., used by gunners in defending themselves and their guns when attacked, either by infantry or cavalry, at close quarters. For the defence of each gun, its horses and complement of men, two carbines are supplied, the ammunition for which is to be maintained by drawing on the cavalry regimental reserve,



PRESENT EQUIPMENT

Fig 1



Fig 2



BRIGHTON EQUIPMENT

Fig 3



Fig 4



the gun, demands an amount of technical knowledge which I do not possess; secondly, because the remarks concerning several articles of artillery equipment, &c., apply equally to that of the other branches of the Service under consideration to-day.

Much attention has been given within the last few years to the subject of the equipment for the supply of ammunition in the field; and, with a view to improvement in this direction, Major W. Ellis, R.A., while proposing to raise the number of guns attached to an infantry division from 18 to 24, and also that no guns shall belong permanently to the cavalry brigade, but that a brigade of 48 horse artillery guns shall be formed, from which guns shall be detached as required, suggests that the equipment for the supply of ammunition shall be materially altered. He proposes that the ammunition waggon in present use shall be replaced by two limbers, carrying together the same amount of ammunition as the waggon, and requiring no more horses than the waggon, namely, six; the first line of limbers to be drawn by four horses, which would keep up with the guns in action; the second line to be drawn by two horses, and to move as a rule at a walk. The weight of a waggon loaded is 40 cwt. 0 qrs. 2 lbs., whereas Major Ellis's limbers each weigh, when packed, 18 cwt., or, taken together, upwards of 4 cwt. less than the loaded waggon. Each horse in the service waggon carries or draws 747 lbs., whereas in the 4-horsed limber, each horse would carry 504 lbs., but in the 2-horsed limber each horse, would carry 1,008 lbs. The question among others to be solved is, whether or not this latter weight is excessive when moving as a rule at a walk. I am inclined to think not. Should Major Ellis's proposal be adopted, there would be greatly increased mobility, a more easy and rapid supply of ammunition in the field, and last, but not least, the adoption of such an alteration would be acting out the commonplace, yet common sense proverb that "It is better not to carry all our eggs in one basket." When we consider the tremendous moral effect produced by a concentrated, well directed, and rapidly delivered artillery fire, directed and delivered in such a manner as, I am led to believe, on the authority of the latest experiments, only our British gunners can effect; when, moreover, we consider that Germany had 4 to 5 guns per 1,000 men in the army corps in their last war, and that Russia deems it necessary to have 4 guns to every 1,000 bayonets and 8 to every 1,000 cavalry; and when we consider that the adoption of Major Ellis's proposals (and I have by no means exhausted them) would raise our proportion to 3 guns per 1,000 bayonets, or 4 per 1,000 men in an army corps; when, I say, we consider these points, and the issues dependent on their right solution, I am sure I am not exceeding when I say that the subject of the equipment for the supply of ammunition in the field is a most important one, and demands a searching and extended investigation and an early settlement.

A few words with regard to the fire-arms, &c., used by gunners in defending themselves and their guns when attacked, either by infantry or cavalry, at close quarters. For the defence of each gun, its horses and complement of men, two carbines are supplied, the ammunition for which is to be maintained by drawing on the cavalry regimental reserve,

and on the cavalry carts with the sections of the army corps reserve. These carbines are carried with their sword-bayonets on the gun-limber, and, as a rule, are taken with the limber under cover when the gun is in action. The gunners with the guns are thus left with their side-arms to defend themselves and their guns from an attack at close quarters. Now the fact of their being supplied with such a weapon proves incontestably that they are supposed to expect such an attack, and to meet it as best they can with the weapon provided. Is this provision of carbines and side-arms sufficient for the purpose intended? Suppose the carbines with ammunition were always given to the gunners with the guns, and that the cavalry supply-carts were always so conveniently near that the supply of ammunition could be maintained, would they then constitute, with the 74 sword-bayonets in the hands of the gunners not armed with a fire-arm, an adequate defence against a well-delivered attack by cavalry at close quarters?

One thing we may safely say is this: such a provision never enters into the calculations of the attacking party.

Should, on the other hand, each gunner be given a six-barrelled revolver, taking guns, even by surprise, would be a much more dangerous game than under existing circumstances. Again, the man armed with carbine and side-arm has his hands full, and unless he lays the first-named aside, with the strong probability of losing it in the hurry of action, he is useless in working the gun; but take it and the side-arms away, and let the man wear the waist-belt only, and let him have a pouch for his ammunition and his revolver attached to the waist-belt behind his back, so that he can slip them both with ease from rear to front, and you have both his hands free to work unimpeded, and he has a weapon which can be used with considerable effect at close quarters.

With regard to the tunic, I cannot help thinking that utility and the comfort of the man are in too many cases sacrificed to appearances. As a rule, the tunics are made much too tight round the neck and chest to be comfortable in working, and I believe that if the tunic were cut in one piece from the collar to the bottom, as some of the native cavalry in India have them, it would last longer and look far better, as there would be no seam under the belt to wear threadbare and white, while the rest of the garment remained in good repair.

My remarks on the head-dress of the artillery being identical with those I have to make upon that of hussars, I pass on to the boots at present in use in this branch of the Service. I am informed that the gunner receives three pairs of Bluchers or ankle boots and one pair of Wellingtons in two years. Now, with regard to the latter, there are many, myself among the number, who have been led to believe that it is a most unworkmanlike article of kit.

At some athletic sports at Aldershot, I saw a tug of war between a team of as fine a set of gunners as one could well pick, and a team of an infantry regiment. I watched with interest for the result, because at that time I was trying to devise some improvements in military boots. I was not surprised to see the gunners slip down several at a time and in the end lose the tug, because they nearly all had on the



Wellington boot, having come to the games dressed in walking out costume, and when they pulled on the rope and turned sideways, their heels gave way and consequently their ankles turned and down they went. The same principle would apply in going over rough ground, or dragging guns, especially in mountainous country. Again the cost of the Wellington to the country is, as a rule, 16s. 10d. per pair, that of the ankle boot, 10s. 6d. Further, the cost to the man for new fronts to his Wellingtons, is 14s. 6d., no small item out of a private's pocket. I have here a highlow made on an entirely new principle; the side seams, as you see, open to the rear and not as in ordinary boots to the front; rain hard as it may, no water or mud can possibly beat in and wet the foot; it fastens simply by a strap and buckle on each side, and when on, you cannot tell the difference between it and the Wellington; but in the one important point in which the Wellington fails, namely, support to the ankle, it succeeds. It is, moreover, lighter than the Wellington, and in the space taken to store 700 Wellingtons, you may store 1,000 of this class. Further, it costs the man less than half to repair, and the cost to the country would be 6s. 4d. per pair less than the Wellington; in other words, the Government would save 3s. 2d. per annum for every man so equipped. This boot has one serious disadvantage, viz., that the whole army of boot-makers and contractors would be against it, because it would deprive them of the profit on 3s. 2d. per man per annum. On the other hand the Wellington boot has an advantage which is considerable in the eyes of a small number of Officers who go in for appearances rather than for utility, namely, that the trousers fit over the foot with a few less wrinkles than it would with the other; but then who talks about the wrinkles at the bottom of an infantry man's trousers, although he wears a short boot in full dress?

In concluding my remarks on this branch of the Service, I desire to draw your attention to the fact that the various classes of artillery, whether heavy, medium, or light, are distinct, and that for the various duties connected with the guns, two distinct classes of men are chosen, the gunner as a rule is the heavy man, the driver is always chosen for his lightness in comparison.

This principle of "the right man being put in the right place" seemed to hold sway in the classifying of infantry from the earliest times, for instance, about 300 B.C., the Grecians had three distinct classes of infantry, heavy, medium, and light, equipped and armed according to their various characteristics. They fought in three lines, the light foremost, then the medium, and the heavy last; in the same way, at the time of the second Punic war, the Romans had four distinct classes of infantry; they also were distinct with regard to physique and equipment, and fought in three lines as the Grecians did, except that the fourth class, the lightest, fought between the legions.

Now, without going into the development of our own infantry from its earliest history, the fact remains that we have preserved three distinct classes of infantry in our Army, and no one can fail to notice the great differences which exist with regard to the size, weight, and



pace of the various classes in this arm in the present time, and on service the light would be used on occasions when the heavy would be useless, and *vice versâ*.

The progress made by other nations; the introduction of breech-loading rifles; the increasing value of artificial cover for the infantry soldier and other things, have drawn considerable attention to the equipment of this arm, and one cannot read of the results of past wars, and study the progress of the present war, and also ponder the possibilities and probabilities of the future, which future—for us, may not be very far off—without coming to the conclusion that some important and very material changes are necessary. The question which would naturally propose itself at the outset is this, “Have we kept pace with the times, and altered our equipment to meet the requirements of modern warfare?” On careful consideration, I think the answer must be, that “If our pace is not quite that of the times, we are pretty handy, and moreover, just now it is evident, from the number of committees appointed within the last few years to consider this subject, that we are going to quicken our pace considerably.”

There are few but will admit that the Henry-Martini rifle now in use is in many respects a step in the right direction, but even it has some serious defects, most of which can be remedied easily: first, the length of barrel is insufficient; this makes the arm awkward when at the “order”; far worse, it takes away, to a considerable extent, its efficiency as a bayonet-carrier. It is no less than 10 inches shorter with bayonet fixed, than the Turkish weapon made in America at a cost of about £2 15s. or so, and called the Martini-Peabody.<sup>1</sup>

Another great defect in this arm is, I believe, the spiral spring in the breach action; the practical result of the adoption of this class of spring instead of the well-tried flat mainspring has been that to secure a 16 lb. blow a spring with a force of 40 lbs. had to be adopted; this led to an excessive strain on the sear-nose, and the introduction to obviate it, of another complication of the lock. I may remark that several examples of flat mainsprings may be examined which show that there is no difficulty in having a flat mainspring if desired.

Again the divided stock is objectionable; first, because the recoil is much more severely felt where the greater part of the shock is transmitted by an iron bolt, not indeed touching the heel-plate, but yet far from having the elastic movement of the whole old stock; secondly, when the stock of the Martini-Henry shrinks or expands from the effect of climate, a change by the armourer-sergeant in the curve of the guard lever becomes necessary, or the breech cannot be shut.

Again the distance from the toe of the butt to the trigger ought, as is well known to gun-makers, to be exactly  $14\frac{1}{2}$  inches, but this has been overlooked in the weapon under consideration, and the consequence is that the Martini-Henry has a misshapen stock, ill-adapted for good shooting when rapid fire is resorted to.

One other serious defect in this weapon is that the hold or grip of

<sup>1</sup> Having found that the information given me regarding the reduction of the charge for the Martini-Henry rifle was incorrect, I am glad to be allowed to withdraw unreservedly the remarks made by me on that point.—F. G.

the arm is entirely metal, and most inconvenient, in winter weather, in cold countries.

Some of the above defects are under consideration now, and it is, I believe, proposed to bring up the present total length to that which is deemed necessary by lengthening the bayonet. Would it not be better "to kill two birds with one stone," in gaining the required length by adding to the barrel, and thus be able to use the originally-intended charge of powder, and regain the good trajectory absolutely forfeited under present circumstances? This brings me to the cartridge now in use; it is a built-up one of greater weight than necessary by 10 per cent. (or 10 cartridges per 100), a very serious consideration. It is composed of various metals, and liable, as shown in India, to spontaneous decay in the magazines, from electrical action; it is, moreover, more expensive and less simple, as well as weaker than a stamped metallic cartridge.

Now, supposing the above-mentioned defects to be remedied, what then? Are we to rest satisfied with putting a good weapon in the man's hands? No! we must seek to place the man in such a position that, with safety for himself, he may bring his weapon to bear on the enemy with the greatest obtainable effect.

We must all admit that natural cover does not always admit of the above-mentioned conditions being fulfilled; it, therefore, becomes necessary to provide the man with the means of making artificial cover, the value of which is incontestably proved by the occurrences of past wars and of that now in progress. Our own action in the matter, together with frequently-expressed public opinion, shows that the importance of the subject is increasingly appreciated, but I am rather inclined to think that the equipment for the provision of artificial cover for infantry is supplied, if I may use the simile, in too homœopathic doses. I think allopathy is the system for the patient under treatment, for instance, in order to supply an infantry regiment, of 1,000 bayonets, with trenching tools in action, one cart (No. III in the circular of December, '77), weighing when packed 18 cwt. 3 qrs., and drawn by two horses, is allowed. Amongst other necessities, this cart conveys 304 implements suited for entrenching purposes. Now, the manifest disadvantages of this system are, 1st, loss of time, an important element, in serving out the tools; 2nd, the number, when issued, is inadequate to perform quick work; 3rd, the cart cannot be in every place at the same time; 4th, it is liable to injury or destruction by artillery or other fire; 5th, many places where the regiment would be required to go would not admit of its following; 6th, it is liable to be lost, and there would be the trouble of the supply of forage for the horses and escorting.

I have here two inventions for intrenching purposes, one invented by Surgeon-Major Oliver, the inventor of the magazine equipment now under the consideration of the authorities; the other, the invention of Colonel Rice, of the American Army. The latter has undergone a thorough trial, in actual service; the former has not, I believe, been submitted as yet to His Royal Highness the Field-Marshal Commanding-in-Chief, and is, in one sense, therefore, untried. Colonel Rice's invention is an amalgamation of the bayonet and trowel, and each man

carries one; it is light, and but little more expensive than the old bayonet, and about the same or less expense than the sword bayonet in present use.

Bear with me whilst I give you a few interesting facts touching its trial.

General Miles writes:—"As a trowel it has been severely tested under my immediate supervision. A company in single rank, working in a soil of medium hardness, threw up, in the space of ten minutes, a work along its entire front of sufficient height and thickness to protect a line of battle. The work was tested, and found to be bullet-proof against the Springfield breech-loader; at a distance of 20 paces the balls would not penetrate half through the work. As a bayonet, I believe that it is as formidable a weapon as the one now in use, and that as severe a wound can be inflicted with it. Also its moral effect in a charge would be as great as that of the old one." The Small Arms Committee report that "Three men formed a breast-work 5 feet long, 3 feet thick at bottom, 1 foot thick at top, and 19 inches high, in 4 minutes. The soil was very hard, not having been disturbed for over 20 years, besides being full of roots, &c." In the second trial, in easier digging, they cut a trench 6 feet square, and made a parapet similar to the above, and when lying down in the trenches, they could not be seen at 10 paces distance. "This," continues the report, "is making cover in a much less period of time than entrenching tools could be ordered and brought up from the rear to the front of an army." The following is a resolution of the Board appointed to report on it:—"Resolved: That the Board recommend to the War Department that the Rice trowel-bayonet be adopted for the use of the military service." The Board was composed of a number of Officers of high rank, as well as one or two of junior rank, in the American Army. The Ordnance Office thereupon advised the Secretary for War to issue 10,000 of Rice's trowel-bayonets. He did so, and, in the campaign of 1876, on the Yellowstone, according to the report of the General in command on that river, "The men made great use of it in cutting sticks to put up their shelter-tents at night, as hatchets, for digging a small trench round their tents, and in cutting their meat, digging for water, &c." Again, the Commander-in-Chief, writing from Dakota, says, "The experience in this campaign of the troops who are supplied with the trowel-bayonet shows it to be invaluable. It also deserves the name of an universal tool. In my judgment, every infantry regiment in the Service should be supplied with it." Now, these are facts and opinions founded upon fact with regard to the above-mentioned weapon. The fact that a whole line of infantry can be put out of sight in an average time of six minutes, and that in a trench with a parapet in front which is impervious to bullets fired from breech-loading rifles at a distance of only 20 paces, speaks volumes; further, the fact that the man carries the implement himself, without any increase of weight, thereby doing away with the need of the cart now used for its conveyance, and freeing the cart-horses and driver, as well as part of the escort, to be used for other purposes, also speaks volumes, because the man is then able,



the moment the word "halt!" is given, to set to work, without loss of time, and make cover for himself. The disadvantages accruing from the adoption of the regular spade-form of trenching tool for each man may, to a limited extent, be seen even before experiment; first, the soldier would have to carry  $3\frac{1}{2}$  lbs. to 4 lbs. extra weight; there would be a loss of time in detaching and fitting and then in unfitting and attaching again; and also an extra expense to the country. The advantages would be that the implement could accomplish more work if the men did not get in each other's way, owing to its size and length, and that it acts, when adjusted according to Dr. Oliver's proposal, as a shield to a very vital part of the man's body. The latest instructions published by authority on this matter, that I have been able to lay my hands on, and which are imparted to the students at all garrison instruction classes, show that men at an interval of about 4 feet can make a trench, with the larger tools, 7 feet wide and  $1\frac{1}{4}$  deep, with the requisite parapet, in 50 minutes, taking the mean time laid down. I think, therefore, that there can be no two opinions as to the result of comparison between the trowel-bayonet system and our present system from this point of view.

A military correspondent of one of the daily papers wrote some little time back to the effect that the trench dug by the Turks was a better trench than that in vogue amongst us, because it was made  $3\frac{1}{2}$  feet deep instead of  $1\frac{1}{2}$ . Now, an essential feature in a good trench is, that while it gives sufficient cover to the defenders from the fire of the enemy in front, yet, if they are driven out by the enemy, it shall not afford him sufficient cover from fire from the rear. I think that one of the causes of the many failures of the Turks to retake the entrenchments captured from them, was that their trenches were so deep that they afforded good cover either way. Our American friends lay more stress on the moral effect than on the actual effect of the bayonet; and, perhaps, they are right when we consider the statistics of the causes of the casualties in the Franco-German war as supplied by the Germans; they were as follows:—95 per cent. from the bullet, 4 per cent. from artillery fire, and only 1 per cent. from sabre, lance, and bayonet combined. If, therefore, the moral effect be retained by the adoption of a trowel-bayonet, I think the actual effect will, to a certain extent, take care of itself.

I hold in my hand an invention by Admiral Selwyn, in which, without extra weight to the man or gun, a good trowel is provided which fits into the stock of the gun which is hollowed out for its reception. The great advantage in the eyes of many in such a system would be that our sword-bayonet would be retained, and that the man would have an efficient tool for trenching without increasing the weight of his kit.

It has been more or less generally felt that the present mode of carrying the man's kit is too cumbersome, and that with it he cannot carry sufficient ammunition to meet the requirements of modern war, the outside limit of what he can carry, being only 70 rounds, or for a regiment of 1,000 bayonets 70,000 rounds. The means also for attaching it to the body are much too intricate.



Surgeon-Major Oliver has attempted to meet the need by an invention called the "Magazine Equipment." I think it is fitly so named as it makes every man his own magazine, and with regard to ammunition, food, clothing, and waterproof sheet, it makes him quite independent of the base of supplies for 24 hours. This equipment is, as you see, very simple in design, and will, if adopted, relieve the man of a great many encumbrances in the way of straps, ballbags, haversack, &c., which now interfere with the free manipulation of his rifle and trenching tools. The chief parts are two bags for kit, the lower one, as a rule, is left in the barrack room in time of peace, except when marching from one station to another, and in time of war is left at the base of supplies. The great coat is taken out of the top magazine bag which is then placed on the belt, and the coat is hung on the shoulders. The magazine bag contains a day's rations, waterproof sheet, and 100 to 150 rounds of ammunition, which is conveyed to the expense pouch in front of the man by simply bringing the magazine bag from rear to front, which, as you see, the man can do with ease and comfort to himself. Another great advantage in this mode of equipment, is that the man can march at ease with open belt without fear of the kit falling off or being disarranged. He can, moreover, get at any thing he wants without help; moreover, the whole kit is more compact and rests nearer the centre of gravity of the body; further, it does not cover the whole back, and so allows a free passage of air. I beg now to draw your special attention to this fact, namely: that a regiment of 1,000 bayonets equipped in this kit, can, without extra weight, and with greater personal convenience, carry no less than 72,000 rounds of ammunition, more than an equal number of men equipped in the valise equipment in present use, together with the three ammunition supply carts attached to an infantry regiment. Add to the "magazine equipment" the trowel or trowel-bayonet, and you eliminate one cart weighing 18 cwt. 3 qrs., at present used to carry the required entrenching tools. (For full particulars see Appendix.)

With regard to the head-dress of the infantry, I am sure that the regiments which have been, and are to be supplied with helmets instead of the hideous shako, are to be heartily congratulated, as a more useless, ill-shaped, and, as regards sunstroke, dangerous article of equipment could scarcely be contrived. I feel sure that next year's manoeuvres, if there be any, will prove incontestably the wisdom of the change. Contractors are, however, inclined to increase its height.

A word or so about the tunic. At first it was made so tight that a man seemed as though he could scarcely do more than walk straight to his front; later on they were made rather looser, and in 1854 still more so; but now I fear that comfort and utility are sacrificed on the altar of appearances in many regiments in this matter. It is a great mistake to think that a tunic cannot be made smart and comfortable as well, and that therefore it must be made very tight. With regard to the making of the tunic, the remarks touching the artillery tunic apply equally here.

I cannot pass from the subject of infantry equipment without drawing attention to the boot now in general use in this branch of

the Service. The complaints with regard to this article of kit are loud and general. Some of the disadvantages it is said to possess are, 1st, that after it is in wear some little time it becomes very unsightly through the gaping of the seams to the front—that the seams thus let in water, dust, and mud freely, and give, as a natural result, many sore feet. The man has to keep up laces, and these rot when often wetted. Again, when the men are in camp and have to march early in the morning, it is difficult for them to fasten the boot on properly owing to the small size of the lace-holes. Now, with this new boot no seams show to the front at any time during wear; when on it looks like a Wellington as far as neatness goes, and is easily taken off or put on by means of this simple buckle and strap, and the need of laces is done away with. As far as storing these boots goes, they can be stored in exactly the same manner as the boot in present use, and cost the same money. This is a boot I had in wear nearly two years at Aldershot and Hounslow (Fig. 21, Plate VI). It was worn through the heavy snows of 1874 and 1875, and has, as you see, had but little done to it in the way of repair. I wore it without the aid of the buckle in plain clothes as well as in uniform.

In speaking of the equipment of cavalry, it is not my intention to detain you long by tracing the various and most interesting changes that have occurred with regard to this branch of the military service; enough to notice the crisis that was reached upon the invention and introduction of gunpowder. It was then thought necessary to introduce by degrees fire-arms into the cavalry arm, thus they were often, to their great discomfiture, pitted against infantry. Then, in the early part of the sixteenth century they were intermingled with infantry, and the pace of the charge was reduced to the trot; the result of such a formation was, of course, not satisfactory. Colonel Denison remarking on these and other attempts to bolster up the waning use of cavalry against infantry says, “these facts all serve to show how “completely the soldiers of that age misunderstood the real value and “uses of a cavalry force, and how completely the invention of firearms “had upset the whole principles of warfare.”

For a long time there were in existence two classes of cavalry—the heavy, which were more or less independent of infantry or other troops, and the light archers, who were included for tactical purposes with the gensdarmes, but who were banded together for these purposes in 1494, when Charles VIII entered Rome.

To come at once to our own cavalry: we now have three classes of cavalry in our Army. They are generally called heavy, medium, and light, and no doubt the heavy and medium fulfil to a certain extent the requirements which their names imply. But what about our light cavalry? Does it do so? I fear the line of demarcation between our medium and light cavalry has been trodden down to a great extent.

When we consider the important duties which cavalry, especially light cavalry, has now to perform; when we think that the safety of an army is to a very great extent dependent on the information concerning the enemy's movements that its cavalry provides; and, in the

second place, when we think of the importance of hiding from the enemy the movements, dispositions, and numbers of the army to which it belongs, to say nothing of obtaining information concerning the country to be passed through, and that in performing these necessary duties it may have to cover a great amount of ground at a rapid pace, should not this branch of the cavalry arm be horsed, manned, and equipped, in such a way as to fulfil the term "light" to the very letter?

Let us see what the hussar was in 1802, and then compare him with what he is now.

On referring to Charles James's "Military Dictionary" of 1802, we read that the hussar was dressed in a fur cap—a very different thing from the instrument of torture we at present wear—a jacket, breeches, and boots; they were armed with a crooked sabre, pistol, and carbine; he says, "their equipage is so light, and themselves such "excellent horsemen, that no other cavalry can pretend to follow "them." What is the case now? The average weight of the hussar on service now, including ammunition, forage, and ration, and deducting articles of kit left behind, is over 19 stone. The average weight of the men in my regiment who would go on active service to-morrow is 11 stone—the average weight of the whole regiment, including boys and the last joined recruits (a spare lot, as a rule), is 10 st. 7 lbs. The weight of their equipage brings up the total to the above-mentioned figure, 19 stone. Look on that picture and on this. There are many men in the hussar regiments who would make first-rate life-guardsmen, and very many who would make good lancers, and there are some lancers who would make good hussars, as far as weight is concerned.

Compared with the Austrian hussar, in 1873 or thereabouts, taking the weights of the horse, man, and equipment together, our hussars weighed 120 lbs. more, man for man. The French dragoon only weighed 70 lbs. more than our hussar, and the Prussian lancer weighed only 30 lbs. more. Since then, I believe, our equipment has grown heavier, and the men enlisted as hussars are bigger; and last, but not least, the horse meant to carry them is of a much inferior class.

I believe that horses for military purposes are becoming more scarce every year, and that the present system of supply requires considerable modifications.

When we consider what the horse for light cavalry is expected to do, I maintain that this question calls for very grave consideration. Many, whose opinions are entitled to respect, believe that our horses are bought too young; one disadvantage of doing so is, that a horse has all his baby sicknesses before him; and I am informed that in this country the loss through these is about 3 or 4 per cent.; further, it is a year before he can be used in the ranks, and this takes away a man per horse from general duty and parade work in order to train and attend on him. The present price paid for a trooper is 40*l.*, and the usual age at which they are bought is rising four; so, at the rate of 1*s.* 9*d.* per diem for food, by the end of one year the horse costs the



Government 71*l.* in round numbers. I, among many others, believe that if the price were raised to 60*l.* or 65*l.*, and horses bought a year or two older, great benefit would be obtained, but then this would be merely a palliative measure, it would not strike at the root of the disease; and there are causes at work now in the country which, before long, will so aggravate the disease that the cure will be very costly; the country is being overrun with a worthless, unsound class of stallion; and, owing to the low rate charged by the owners, farmers who sell to the recognised buyers for military purposes prefer to patronize them, so that it does not pay a man now, as it used to do, to keep a good horse for the purpose under consideration.

How does the case stand now? The war strength of a cavalry regiment in horses is 480 troop horses and 44 for draught purposes. Suppose fifteen cavalry regiments were ordered abroad within six weeks, we should want for each regiment 120 to 164 horses; and to obtain say, to take about a mean, 2,000 horses, we should have to draw upon the second line to an alarming extent. Then comes the difficulty of filling up the gaps caused by death, loss, lameness, sore backs, &c.; and further, the still greater difficulty of filling up at once the ranks of the second line, and of establishing a reserve; this would require many thousands of horses within a short space of time.

Turkey wanted 3,000 horses the other day, and could not get them, "For" (the question of neutrality put aside for the moment) to use the words of Mr. Tattersall, "we have not got them to spare, and may want them ourselves, and if we get them at any price, shall have to pay a high figure for an inferior animal." He further asserts in his letter to the *Standard* of the 22nd December, that, out of 2,000 horses required for last year's manœuvres, 1,500 to 1,800 came from abroad.

I believe there never was a time when we needed so much to look this question straight in the face as the present; and I believe that the only cure must be found in the establishment of regular studs, on the same principle as those of Russia, Germany, Austria, and France. Mr. Tattersall, in supporting this view, asserts that the result would be to "have a good supply of the right sort of horses when required, and at a cheaper rate."

I am inclined to think that our horses are, as a rule, very faulty in front of the saddle; and, considering the great weight they have to carry, the great height at which the kit is at present adjusted, and the long distances they may have to travel, I think that the horse needs to be particularly well shaped about the forehead. This brings me to the saddle in present use. Much attention has been given of late years to this subject, but no definite result has been attained as yet.

The manifest defects of the present saddle are, that the kit is carried too high off the horse's back, and when the man is mounted and the girths loosen, and when the man becomes tired, there ensues such an amount of sway that a sore back is the infallible result; further, the man's bridle hand is forced into a most uncomfortable position. The panels require constant re-stuffing, another fruitful cause of sore back; lastly, the weight of the whole kit is borne by the saddle.



With a view to remedy the above defects, Captain Crichton has invented a saddle and numnah which are undergoing a searching trial in several regiments. He has kindly placed one at my disposal to-day; you see the saddle carries the man, his arms and shoe cases only; the numnah carries the cloak and kit, and they are independent one of the other. The numnah is made of leather underneath next to the horse's skin, then comes a layer of felt and then one of canvas; the straps are fastened by means of rivets to pieces of sheet steel in front and rear between the canvas and the felt, and these pieces of steel keep the numnah up so that it shall not press on the withers or back; the numnah, besides carrying the kit, now takes the place of the panels, and it has no stitches on the side next the horse. The advantages this combination gives are, that the weight of the whole mass is distributed in three places instead of one. The whole kit is lowered about seven inches, which prevents the top-heavy rocking motion so apparent in the saddle in present use. The kit takes very much less time to clean, as the numnah keeps every article from touching the horse's sides, and there are fewer buckles and straps, and, as these latter are conveniently placed, the kit can be turned out in considerably less time than can obtain under existing regulations and equipment (Plate VII).

The blankets for man and horse can be carried, if necessary, between the saddle and the numnah without danger of shifting or becoming wrinkled, or allowing dirt to accumulate, as the numnah would still be next the horse's skin. The crupper and breastplate can be dispensed with, as the numnah adjusts itself to the shape of the horse's back; also, this saddle not having the rounded sideboards projecting in front, but being shaped like a plain saddle, does not shift forward. It is considerably lighter than the saddle in present use.

The numnah can be equally well made without the leather and with the felt next the horse's skin, it being still a moot point which is best. (For further particulars see "Crichton" in the Discussion.)

We must now consider the question of armament for cavalry, and when I think of the small number of cavalry we possess compared with that belonging to the Continental Powers, I am reminded of the causes which forced Alexander the Great to stop short at the Oxus, the cause of the annihilation of the glorious army of Persia under Darius in Scythia, the cause of the disasters which befell the legions under Marc Antony and Crassus at the hands of the Parthian light horse: I am led to ask, why was it that Richard Cœur de Lion failed against the hosts of Saladin? Why was it Napoleon failed against Russia? had the famous Cossacks nothing to do with it? What was it led to the defeat of such great men and great armies, but the want of more of that very arm which formed so important a part of the armies against which they were pitted? These and other considerations lead me to believe that our small force of cavalry should be armed and equipped far better than those of our neighbours, and that the men, horses, and equipment of our light cavalry should receive very special attention, for, to quote the words of General Sir Charles Napier in his "Defects, Civil and Military," "hussars our men are

“not: a real hussar, including his twelfth part of a kettle, does not weigh twelve stone.”

It has already been remarked that the first crisis which brought about great changes in the use of cavalry against infantry, was the introduction of powder and fire-arms; now the second great crisis was, in my opinion, reached on the introduction of the cilindro-conoidal bullet, together with improvements in breech action, which now make it necessary for a body of cavalry to run the gauntlet of ten shots to one that they risked in the time of Frederick the Great or of Napoleon. The manner in which infantry in square simply marched through cavalry armed only with sword and lance at El Bodon, Fuentes d'Onor, Cràone, and Rheims, and other instances, when the infantry were armed with the flint lock musket of short range, proves that cavalry to act effectually against infantry must be armed better than at present. Notice again what cavalry effected against infantry during the American War, now checking all three arms for a whole day, as at the battle of Five Forks; again, coming up with and engaging the enemy's rear-guard, while a considerable portion went beyond and took up a strong position, dismounted, and then finally inflicted very severe losses and took 6,000 prisoners and 16 guns. Again, see how cavalry dismounted, although ridden over, finally defeated their mounted opponents at Okolona, where Forrest's dismounted men were charged by three lines of Federal cavalry, but succeeded in repelling them; a fourth body of Federals then broke his line and got among his men, who at once took to their revolvers and shot down a great number and took many prisoners, and, finally, those who did succeed in getting through were discomfited by the reserves.

The question now is, what is the best armament for our cavalry? I answer at once that it is my firm belief that the front rank of all regiments should be armed with lance and revolver, and the rear rank with sabre and carbine.

Permit me to bring to your notice the opinions of others, also a few facts from history, and the action of other Powers in Europe. With regard to *les armes blanches*, this is no new idea, for Cromwell, describing the Battle of Dunbar, writes: “But here on the right, “their horses with lancers in the front rank, charge desperately and “drive us back across the hollow of the rivulet.” Again, in March, 1828, the Emperor of Russia ordered the lance to be used in the front rank of all regiments then about to engage with the Turks, moreover, it has been in vogue for a long time in some of our irregular cavalry in India.

The lance is the best weapon to bring first to bear on the enemy, but it is no use in a *mêlée* and must be supported by the sabre. This is proved by the fact that, at the Battle of Aliwal, when the 16th Lancers broke into the Sikh squares, they were cut down right and left by the Sikhs who had put down their muskets and taken to their swords. The casualty-return of January 29th, 1846, speaks volumes: it runs thus:—“Cavalry—first brigade—H. M.'s 16th Lancers, “2 European Officers, 56 men, 77 horses killed; 6 European Officers,

"77 men, 22 horses wounded; 1 man, 73 horses missing." This gives a total of 8 Officers, 134 men, and 172 horses placed *hors de combat* in one fight.

Sir Hope Grant was not caught thus, for at Meangunge the 9th Lancers charged, supported immediately by the 7th Hussars and Irregulars, who cut down 500, and took 400 prisoners.

Nolan says, "All seem to forget that a lance is useless in a *mêlée*." Marshal Marmont in his "*Esprit des Institution Militaires*:" "It would be better for cavalry to have both the lance and sabre . . . the lance should be the principal weapon, and the sabre an auxiliary arm." Jomini says, and his utterances are clear and to the point: "In charges in line the lance is very useful; in *mêlées* the sabre is much better; hence comes the idea of giving the lance to the front rank, which makes the first onslaught, and the sabre to the second rank, which finishes the encounter usually in individual combats. The lance is the best arm for offensive purposes when a body of horsemen charge in line, for it enables them to strike an enemy who cannot reach them, but it is a very good plan to have a second rank as a reserve armed with sabres, which are more easily handled than the lance in hand-to-hand fighting, when the ranks become broken." De Brack also calls special attention to the necessity of supporting lancers by swordsmen.

With regard to fire-arms, Trower writes in his "Hints," that there should be 10 carbineers to 50 lancers—this is an advance in the right direction. Hozier, in his "Seven Weeks War," when speaking of an axiom applying to cavalry, says, "But it no longer applies since the introduction of breech-loading rifles. The *morale* of cavalry will not be affected if lancers are properly instructed as to the use of these arms." The use Sheridan made of his 10,000 horsemen, when dealing with General Lee's rear-guard on the way to Lynchburg, is very striking, but then they were thoroughly instructed in the use of these arms, and, as noticed before, were the means of 6,000 prisoners being taken, together with 16 guns and 400 waggons. This was effected against cavalry, infantry, and artillery combined, and with the advantage of a well-chosen position. The determination came to, therefore, by His Royal Highness the Field Marshal Commanding-in-Chief to give our lancer regiments a breech-loading carbine which will be effective up to 800 or 1,000 yards, places them in a position to act in a like manner when occasion presents itself. The late wars prove conclusively that, except under the most exceptionally favourable circumstances, cavalry should not attempt to charge bodies of infantry. The four charges made by the French light cavalry at Sedan is a case worth noticing in support of this view, and again when at Plavigny, near Vionville, General du Preuil charged the Prussians and lost in a few minutes 22 officers, 208 men, and 243 horses, and the Prussian infantry did not lose a man.

Now, with regard to cavalry being opposed to cavalry, I would remind you again, that the casualties during the Franco-German war stand thus: 95 per 100 from the bullet, 4 per 100 from artillery, and 1 per 100 from lance, sabre, and bayonet, combined. In November,



1864, a fight took place in Virginia between a squadron of Federal cavalry armed with the sabre, and a squadron of Mosby's, armed with the revolver; the loss of the latter was 1 man killed and several wounded, and the loss of the Federals was 24 men killed, 12 wounded, and 62 prisoners—36 killed and wounded out of 100. In a similar fight, the sabres lost 26 killed and wounded, 54 prisoners, and 80 horses, the Confederates, who were armed with the revolver, lost not a single man.

On the other hand, in 1799, at Egmont-op-Zee, two troops of English cavalry charged 500 French and drove them off; the French rallied and charged again; however, the result of both *mêlées* was the loss on the English side of 3 killed and 9 wounded. Similarly, out of 65,160 killed on the German side in the war with France, 218 only were killed and wounded with the sabre and clubbed musket. The killed by the sabre in the whole six months' war, including Woërth, Vionville, and Sedan, together with the battles on the Loire and the northern provinces, as well as all the outpost service, extending over nearly half of France, was six, notwithstanding that there were 40,000 men engaged. What does Sir H. Havelock say about the American cavalry? "The practical experience of nearly four years of continual war, the entire and untrammelled confidence placed in good men amongst the Northern leaders, when they proved themselves to be so, and the complete freedom left them of devising and executing the improvements their daily experience suggested, had enabled Sheridan, and one or two more of similar bent of mind, to shake themselves free of the unsound traditions of European cavalry theory, and to make their own horse, not the jingling, brilliant, costly, but almost helpless unreality it is with us, but a force that was able, on all grounds, in all circumstances, to act freely and efficiently, without any support from infantry."

What were the best cavalry in the eyes of Napoleon? He held that the Poles and Cossacks were the best light cavalry in Europe. How were the former armed and equipped? Roemer, in his "History of Cavalry," says, "At its reorganization in 1817, the Polish army contained both heavy and light cavalry. The former consisted of 144 companies, half of which, armed with lances, formed the front rank, while the other half, armed with carbines, formed the rear. Each man had also sword and pistols. This heavy cavalry was further divided into *husarz* and *paucerny*." He further says, concerning the light cavalry, "They wore no defensive armour, but in other respects were equipped like the heavy cavalry."

With, therefore, such conclusive evidence before us, with such a host of opinions of men of vast experience, must we not conclude that the best armament for our cavalry all round is lance and revolver for the front rank, and sabre and carbine for the rear rank. No regiment ever has more than about one-third of its carbines in use at the same time, and therefore it is superfluous to arm with carbine all round; whereas if all the best shots (and I believe the prizes for shooting ought to be doubled) were put in the rear rank, and were mounted on the quietest horses, I believe the end required would be attained, and



that without extra expense. In concluding my remarks on this point I will only add, that I think that the fact of Russia having adopted this plan for a long time back, and that since the Franco-German war, Prussia, Austria, and Italy also, have begun to do so to a great degree; these facts, I say, ought to have considerable weight with us who possess such a small force of cavalry, and who ought, therefore, to equip them in the best possible manner.

One word with regard to the bushby. In its present shape it is a mere parody on the original, which was simply a band of fur, with the bag hanging over the side; a small cock's feather was also worn. Now, it is so high off the head that it forms a regular catch-wind, and being hollow at the top, it also makes a very efficient rain-trap. A further serious disadvantage it possesses is, that when brought in damp, with the perspiration of the man's head, as well perhaps as with the rain, it is put in a bag and hung on a peg, and thus the brow-band contracts and causes great pain to the man, especially when riding against the wind. Further, it is no protection against the sun at the back of the neck. This helmet (*pointing*) would have the advantage in looks, comfort, and utility, for it gives good cover to the eyes and back of neck, and further, would last five times as long.

The cavalry tunic is made in many instances too tight, and I believe it ought to be made in one piece from top to bottom. Now that the stable-jacket is, fortunately for the comfort and pocket of the soldier, a thing of the past, he requires some sort of undress jacket in which, as a recruit, to attend riding-school, foot drills, and fatigue work. If he has to do all these duties in his tunic, it will not be fit for much a short time after issue. The jacket at present in trial in several regiments of cavalry, as well as in the artillery, has not, I think, much chance of finding favour in the eyes of the Officers of the corps in which it is being tried, with the exception perhaps of the 17th Lancers, because it is, as a rule, so badly cut. The jacket which I had the honour of submitting to His Royal Highness the Field-Marshal Commanding-in-Chief some two years ago was a well-fitting, smart jacket, and the 17th Lancers have kept to it as nearly as possible, but those issued to the Artillery are more like a very badly-shaped tunic, while those issued to the 7th Hussars, although I believe the Commanding Officer is in favour of them, might be made much smarter, with the simple and inexpensive addition of a scarlet collar, and perhaps scarlet piping, which would take away the general idea of plainness they give at present.

One great instrument of torture to the soldier is the sword-belt. After a long ride the pressure on the region of the colon, kidneys, spleen, and lower part of the liver becomes almost unbearable. I have here an idea which, carried into effect, would, I trust, do all that the sword-belt is required to do, and that without any discomfort to the man, and with great saving to the country.

By it, as you see, the sword can be hung from the shoulders, the proper place, and not from the waist, the left shoulder bearing the weight of the front sling, and the right shoulder bearing the back sling. This can be effected by a very simple alteration of the braces

in present use. I cannot pass from the question of hanging the sword without saying a word about the sabretache: a more useless and inconvenient, as well as unornamental, article of kit does not exist. The man never carries despatches in it, it trips him up when dismounted, and stops him when going through underwood; further, there never is a mounted parade but some have to be repaired, having been torn in wheeling, &c., &c. If it were abolished, the country would save a considerable sum of money. Again, in its present shape, it, like the busby, is a complete parody on the original; it was worn several inches higher, and had the opening outside; further, the Lancers discontinued its use in 1854. The adoption of the above suggestion would, besides saving money to the country, give the man more comfort at his foot drill and riding school; but it would not go to the root of the matter in the question of dismounted work on active service; the sword should then be fixed on the saddle, and then the man would be able to act with much greater freedom, and as a natural consequence with greater effect.

Another cause of discomfort is the method in vogue of carrying the water-bottle: this, when filled, weighs somewhat under 3 lbs., and is carried behind the right elbow on the hip, and slung from a narrow strap passing over the left shoulder. Thus it not only positively hurts the man when moving at the trot and canter, but prevents his getting quickly at his pouch. A very simple, and I think effectual, way of meeting the difficulty would be found by adopting this plan, whereby the strap is abolished and the bottle taken out of the way of the pouch, and leaves room for the revolver to be carried in a manner similar to, but not identical with, the American fashion, with the further advantage, should the revolver be so carried, of ensuring to the man an effectual weapon when, by any accident, he may become separated from his horse and carbine. The present havresack is simply divided down the middle by a line of stitching, so that the man can carry his provisions in one side and his tobacco, &c., in the other; the bottle then slips on a leather loop by a strong clip, and will not then hurt the man's side (Fig. 19). The objection to carrying the bottle on the right side gained ground to such an extent that some regiments actually adopted the plan of carrying the bottle on the saddle. The objection to this system is obvious, for the water being meant for the man and not for the horse, let the man be wounded and separated from his horse he loses that very thing which he then so much needs.

One great need in our service is a good method of hobbling our horses in camp; this is an invention registered by Mr. Pallin, V.S., of the 20th Hussars, by which it becomes impossible for the horse to get loose without breaking something. It costs more than those in present use, but it is wiser, I think, to pay a little more for an article of the kind than to lose a number of valuable horses once in a way.

I am informed that it is under consideration whether or not to do away with the Wellington boot for cavalry. Certainly to relinquish it would be to confer a boon on the man and on the country in the way of saving expense, but what will be the substitute? If the man wears his jack-boots always it will entail enormous expense to the country,

because they would have to be issued oftener, and they cost from 1*l.* 1*s.* to 1*l.* 6*s.*. Again, the man would find them most uncomfortably warm in the summer months, besides which, by continual wear, they soon would lose their shape, and would cost the soldier much more to repair than even the Wellington. By the introduction of this boot already noticed, we could combine the highlow and Wellington to a very great extent, and so keep the smart unstrapped overalls for walking out and dismounted work, and thus would also consult the comfort as well as the appearance of the soldier.

I must heartily thank those Officers who have placed their inventions at my disposal to-day, and I also have to acknowledge my indebtedness to the Secretaries of this Institution for their kind help in pointing me to the various sources of information. Further, I have to thank the Assistant Adjutant-General, Colonel Baker, who not only gave me information on various points now under consideration, but generously placed at my service several articles of equipment.

In closing my remarks, allow me to draw your attention to two letters written by Her Most Gracious Majesty the Queen at the time of the Crimean War. One written to Lord Raglan runs thus: "The Queen earnestly trusts that the large amount of warm clothing sent out has not only reached Balaclava, but has been distributed." Again, in writing to Lord Panmure on the subject of the men's huts, Her Majesty says: ". . . there would be no difficulty in obtaining the money requisite for the purpose, so strong is the feeling now in the public mind for improvements of all kinds connected with the Army and the well-being and comfort of the soldier." I have only to remark that the time of the sore and cruel need which gave occasion for the writing of those kind and heartfelt letters was not the time to find out that the coffee brought actually to the spot for the men's use was not even roasted, that the poor fellows' coats were made of such stuff that they rotted off their backs, and that their boots were so badly put together that they fell in pieces off their feet. That terrible tension of the public mind need never have been created; Her Majesty the Queen might have been spared many a bitter night of harrowing and heart-breaking anxiety on behalf of her faithful and patient soldiers, who were dying by hundreds from absolute hunger and exposure, had the evil spirit of "Let us alone, we are as well off as our neighbours," not been in existence, and had the spirit which now obtains in the highest military quarters then found free course, which spirit, I am thankful to believe, pervades to a great extent the mind of that portion of the British public who are interested in our Army, and which finds expression in the words I now take for my text, namely:—

"Prevention is better and less costly than cure."

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#### APPENDIX.

##### OLIVER'S MAGAZINE ACCOUTREMENTS.

THE accoutrements in which my invention is comprised are composed of two braces—magazine brace, and kit brace; two bags—the magazine bag and kit bag; a magazine pouch, a water-bottle, a coat yoke, a mess can, and a waist-belt and frog.



The device termed "magazine-brace" is adapted for cavalry use; and when so used is provided with a cavalry cartridge-holder.

The more prominent portions of the accoutrements are the two braces and the two bags.

My improved accoutrements enable the soldier to carry his kit, a large amount (as much as two hundred rounds) of ammunition, his day's rations of water and food, a canteen, a waterproof sheet, and great-coat. At the same time they dispense with necessity of all cross belts or straps in front of the chest, the present valise bag and ration bag, and all ammunition pouches or ball bags, except one small one, capable of holding thirty rounds of ammunition.

The nature of my invention, and the manner in which the same is, or may be carried into effect, will be understood by reference to the accompanying drawings, which I shall now proceed to describe.

All the straps and braces of which accoutrements are composed are to be made of good bridle-leather, thinned down where necessary, for the small straps; and to be of moderate thickness for the two principal ones, viz.:—the "magazine brace," and "kit brace."

The magazine brace is shown in Fig. 1, and is composed of one main and two side straps. The main strap, A, is fifty-six inches total length from tip to tip when the ends are unbuckled. Its neck or centre part is six inches by two deep, and is shaped to fit the lower part of the back of the neck. The side straps, B, are three-fourths of an inch straps, each twenty inches long, and perforated at the free ends with six holes, each three-fourths of an inch apart.

In the centre part of the main strap are two button-hole slits, *a*, five inches apart, for the iron loops of the kit brace to pass through. External to this point the magazine brace begins rapidly to decrease in width, until, at the distance of six inches more from the centre, it becomes a  $\frac{7}{8}$ -inch strap, and continues so to the ends. Each of its ends is perforated with eight holes, three-fourths of an inch apart; and at eleven inches from the tip of each end is a buckle,  $\frac{3}{4}$ -inch; also a side strap and buckle, *b*, three inches in length on external edge, and two loops higher up one and one half-inch apart from each other and buckle. These are all easily attached to main strap at the same time by means of a leather backing three inches long. When the ends of the main strap are buckled up, as shown, they embrace two small hooks, *c*, to hook on to two brass eyes on the front of waist-belt, C, Fig. 5, four inches from centre of belt.

This magazine brace is made of four pieces joined strongly at the centre with an extra backing of leather. It rests on the kit brace behind the neck, and on the shoulders; and hooks on to waist-belt hooks in front, while *b* and B buckle together at each side of chest after the latter have passed through loops of great coat or magazine bag.

The kit brace, D (shown in Fig. 2), is forty-eight inches long in its greatest length—that is, from tip to tip of strap when in fully extended state. It is a strong bridle-leather curvilinear strap, with a broad centre part twenty-four inches by two deep, cut away behind toward each extremity of this semicircular part for four inches in extent to fit front of shoulders, as seen at *d*. It then becomes cord shaped for four inches, and for the remaining eight (leather) inches, at each end it assumes the dimensions of a one-inch strap. These last eight inches, at each end, loop up and buckle on themselves and inclose in each loop an iron D, to which the hooks of magazine bag, 1 or 2, or coat yoke can be attached as required. Each of these loops is perforated with five holes, one inch apart, for the purpose of lengthening or shortening this kit brace by means of buckles attached. Toward the centre of the broad semicircular part of this brace are two strong iron loops or eyes, *e*, five inches apart. They must be exactly two and a half inches from the centre point of the brace. They pass through the brace from beneath, where they are firmly fixed by means of strong iron stays, which are covered with leather. This brace is made all in one piece, while the magazine brace is, as I have mentioned, composed of four separate pieces of leather, for the sake of economy. When those two braces are worn together, as is usual, the iron loops, *e*, of the kit brace are passed through the holes, *a*, in the magazine brace, and all is then ready for use, and appears as shown in Fig. 3. When on the soldier, they present the appearance shown in Figs. 4 and 5. It



will there be seen that the centre parts of the two braces, firmly connected together, rest on the centre of the lower part of the back of the neck. The kit brace and the main strap of the magazine brace pass together over and in front of the shoulders, where they separate, the latter extending downward to hook on to the front of the waist-belt, the former extending backward between the body and arms, and along the sides well below the axillæ, its rear ends receiving the hooks of the kit bag, magazine bag, or coat yoke, as the case may be. The two back-straps of the magazine brace pass down over back of shoulders and forward along the side of chest, and buckle on to the main strap of the brace at *b*, where the buckles can be easily reached by the hand.

When either of the bags, or the great coat are carried on the shoulders, the back-straps, *B*, before buckling at *b*, pass through loops on the adjacent face of the bag, or between coat and coat straps, and thus steady them in position, retaining them both by this means and by the hooks which engage the loops or eyes, *e*.

The next things to be noticed are the two bags—the magazine bag, Nos. 1 and 2, Fig. 6 (rear view), and Fig. 7 (front view), which resemble each other in every respect, and can therefore be made on the same machinery. They are simple, strong, canvas waterproof bags, having a thick strong leather backing. They are encircled by two strong bridle leather one-inch straps, *f*, each of which is thirty-five inches long, and are free in front, with one-inch buckle attached to lower end, while their centre part is sewed firmly on to the back of the leather backing of bag at the distance of seven inches from centre to centre of each strap, leaving, however, two interspaces unsewed, to form loops, *g*, obliquely for the back straps of the magazine brace to pass through to steady bag on back.

The leather backing must be made of good sole leather, and measure ten inches full in depth by fourteen inches crosswise at the top, and fifteen inches at the bottom; and the formation of this leather backing, and the sewing on of these straps on back, and also hooks, and a leather loop, *h*, at its centre, for the waist-belt to pass through, is the first step in the construction of each bag; and at the same time the straps are sewed on to this backing three pockets are formed of strong loose canvas in the interior of each of the bags. The centre pocket will require ten inches of canvas, and contain eighty rounds of ammunition: the side pockets will contain each ten rounds.

The front wall of each bag is ten inches deep, and has a length of thirteen inches at the top, and fourteen inches at the bottom. The side pieces that unite the front wall with the backing are three inches at top and four inches at bottom. On the exterior of the front wall of each bag are two loose pockets, *i*, five and a half inches wide, and four inches deep. They are situated near the lower external corner of each bag, and open obliquely upward and outward, and are for the purpose of holding each ten rounds of ammunition. Immediately above each one is a half-inch strap and buckle, which buckles on to a short six-inch strap, extending from the back wall of the bag, to support the pocket when full. The cover or flap of each bag is fifteen by twelve inches.

A central strap, *k*, designed principally to hold the mess tin, is provided for each bag, loops being formed on the bag cover or flap for the strap to pass through. The mouth of the bag is strengthened throughout its entire extent by means of a strong half-inch strap sewed all around, except where the two hooks work at the top of the magazine bag. The hooks are capable of moving from side to side of the bag straps, so as to increase or diminish the distance between them from five to ten inches, and so enable either bag to be carried at the back of neck or buttocks. This is effected by forming the magazine hooks with rings, which are held in loops. Hooks to be  $2\frac{1}{2}$  inches and made of  $\frac{3}{16}$ -inch brass wire, and attached to bag by rivets. Each hook can thus move from side to side of the bag strap as desired. This will be seen by reference to Fig. 6, which is a rear view of the magazine bag with the flap or cover uplifted. The hooks, *k*, are represented in full lines five inches apart, so that they may hook into the eyes, *e*, hereinbefore referred to, and enable either bag to be carried at back of neck. They are shown also, in dotted lines moved farther apart—say ten inches—which is the position they occupy when either magazine bag is carried, not on the shoulders, but on the buttocks by the iron D's of kit brace. In the flap or cover of the magazine bags are formed slits, *l*, through which the bag

straps can pass, so as to be under the covers instead of over them; this being desirable at times when the bag contains ammunition; in which case, by passing the bag straps through the slits and under the cover, the cover may be unfastened and raised, and the bag opened without disturbing the bag straps, which will continue to support and uphold the contents of the bag. In the right wall of each bag are two small outside pockets for the carriage of oil-bottle and a jack knife; and I would recommend that there be a small chamber in the butt of every rifle for the reception of oiled rag.

The next part of my accoutrements is the coat yoke, which consists of two straps and a centre piece, with two hooks attached. It is shown in Fig. 9. The two side straps, *m*, are  $\frac{3}{4}$ -inch wide, thirty-two inches long, to encircle and suspend coat, and carry mess tin or a waterproof sheet with great coat; they are connected together near the centre by a strong cross strap, *n*, two inches wide and six inches in length; and at the points of juncture are two small curb chain hooks, *o*, from which the coat can be suspended, either on the shoulders by the eyes, *e*, or on the loins by the iron D's of the kit brace. This device thus affords an easy means of transferring the coat from one point of carriage to the other. The great coat is carried in this yoke so folded that it occupies a space ten inches by thirteen inches, by three inches deep. It weighs four and a half or five pounds. At the centre of cross strap is a small slit for back-straps of "brace" to pass through, and prevent yoke from becoming unhooked.

The magazine brace, with slight change, can be used for cavalry purposes. This is illustrated in Fig. 8 of the drawings.

The cartridge holders I here make use of are waterproof leather pouches, three for cavalry (one reserve) and four for mounted rifles, arranged in pairs, one pair on each side. Each pouch, *P*, is four and a-half or five inches, with collapsing sides and bottom, capable of containing about ten rounds of ammunition. Each pair is united by means of a strong leather backing ten inches long. The upper free end of this backing tapers to one inch, and holds a one-inch buckle, to which is buckled the front or main strap of the magazine brace. To the backing is also attached a side strap and buckle, *b*, to connect with the back-strap of the brace. On the lower part of the backing is a loop, through which the cavalry sword-belt passes. The sword-belt retains the pouches in their place, while the brace upholds the belt and prevents the sword from dragging at the side.

The pouches lie close against the person, and are not in a position to interfere with the sword or bridle arm. By a simple device, the ammunition is prevented from accidentally falling out when the flap or cover of the pouch is unfastened. This device consists of a small piece of leather, sewed on to the front and side walls of each pouch at its mouth, leaving a segmental opening at the back for the extraction of the cartridges by means of the fore-finger and thumb.

This concludes the general description of the bags and braces, and I shall now proceed to state their uses.

When the soldier wears the full set of accoutrements, one magazine bag is carried on the shoulder and the other on the loins, as heretofore specified, each being held at two points, the former by the eyes, *e*, and by the magazine brace straps, which pass through the loops; and the latter by the iron D's of the kit brace, and by the waist-belt, which passes through the belt-loop on back of bag. The bag, No. 2, is for the carriage of the kit, the soldier's bread or biscuit rations, and 20 rounds of ammunition in external pockets.

By this means the havresack is entirely done away with, the meat ration being carried in the mess tin. This bag is in effect the soldier's "clothes box," which, during peace time, is, as a rule, seldom used or needed, but allowed to remain in his barrack room; and on the battle-field the soldier divests himself of it altogether, and leaves it, with the kit it contains, at the base of supplies, either to be piled up, or to be removed in the supply waggons to a place of safety, while its owner is fighting. His number is on it, so that he can easily find it on his return; and if he should be killed in action, Government is saved its loss and that of the man's kit. That part of my accoutrements which takes its place both in peace and war, as well as performs the necessary offices of havresack and extra ammunition pouches, ball bags, &c., is the magazine bag, No. 1—the chief and leading article in my accoutrements.

This special bag, under ordinary circumstances, carries the soldier's great coat and keeps it dry; and when this great coat is taken out of it and carried on its own coat yoke (to be presently described), it leaves this magazine bag free to be used for all the purposes mentioned—either on guard, or on the field of action as a "magazine bag" in the very fullest sense of the term.

When this magazine bag is to take the place of the other on going into action, or on guard, &c., the great coat, with its yoke attached, is taken out of it, and carried on its own hooks or loops at the back of the shoulders, leaving his magazine bag No. 1 empty and entirely at the soldier's disposal for the carriage of his rations and ammunition on the buttocks. When thus placed the ammunition and rations can be easily got at, not only from the bag *behind*, but in *front*, as it can be unhooked in a moment and run round to the soldier's right front on the waist-belt, where the ammunition can be at once got at by unbuckling only the centre strap, the other two straps remaining still buttoned up for the support of the contents of the bag. The front straps of the magazine brace support the belt and bag then, as well as retains the great coat and mess tin on the soldier's shoulders at the same time, and thus enable him to use the ammunition in the magazine bag while "doubling." The waterproof sheet may best be carried on those occasions beneath the magazine bag on the bag straps. This magazine bag has furthermore, as already stated, strong canvas pockets for the carriage, close to the body, of 100 rounds of ammunition, and it can easily contain and carry 40 or 50 more, in addition to the soldier's day's rations of biscuit, which, with the rounds the man carries in front of his body, amounts to about 200 rounds for siege-operation purposes, a total of 140 only being carried during actual field service, which can be done with great ease and facility; the actual weight carried then by the man being more than two pounds less than the English soldier has to bear when carrying seventy rounds of ammunition in his ordinary heavy marching order.

Fig. 14 represents the soldier fully accoutred. Fig. 15 represents him as he appears with the magazine bag No. 2 removed, the coat yoke taking the place of the magazine bag No. 1 on the shoulders, and the latter transferred from the shoulders to the loins.

The kit brace can be worn, if desired, without the magazine brace. In this case the bag or coat yoke will, of course, be carried on the loins. For most purposes, however, the two braces conjoined will be used.

The next thing to which I direct attention is the mess tin strap. This is shown extended in Fig. 10. The mess tin itself, marked E, Fig. 11, is similar in general appearance and structure to that used by the English soldier, but is somewhat smaller, and contains an inner tin called the "meat can." The cover of this can is used as a plate, and that of the outer tin as a frying-pan.

The strap which binds up the mess tin is composed of crossed straps, *p* and *r*. The broad strap, *p*, is twenty-two inches long, two inches wide at the centre, and one-half inch at the ends. The other strap, *r*, is a half-inch strap, twenty inches in length. There are on the broad strap three loops, *s*, for the mess tin straps of the bags to pass through. When the strap is on the canteen its broad part rests perpendicularly on the back of the tin, and its buckle end crosses the lid and reaches to brass loop in front. The mess tin by this means can be carried in no less than six different places on the accoutrements.

The water bottle is that now in general use (see Fig. 12) in the service, but modified by me in a very simple manner, so as to obviate certain serious objections it previously possessed. By attaching to it a brass "rest," and leather "protector," it can be now carried out of the soldier's way in a fixed position behind the right hip, whence it can be removed or replaced with facility; the necessity for, and expense of a chest strap is also done away with; and its metal rims are effectually prevented from staining the scarlet clothing, or falling off when the bottle is dry in store or barrack room.

The magazine pouch, G (shown in Fig. 13), is similar in shape and construction to the cavalry pouches above described, being, however, considerably larger. It is carried on the waist-belt in front by means of a strong four-inch back-strap, loop, and button. This strap, *y* (indicated by dotted lines in Fig. 13), is firmly sewed to the top edge of the pouch behind, and has in its lower end a button-hole slit, to button



on to a stud at the bottom of the rear face of the pouch. This strap is passed between the soldier's belt and body in front, and is then buttoned down, the pouch then occupying the position shown in Fig. 5.

The bags and great coat can be carried by means of iron or brass loops and buttons, instead of by hooks and loops, as herein described, should such be considered more desirable.

### *How to wear and use Accoutrements.*

The accoutrements can be used and worn in different ways, the weights to be carried (which may be either kit, ammunition, great coat, blanket, waterproof sheet, medical appliances for use in the field by Army Hospital Corps, or trenching tools for throwing up earth works), being all transferable from one point of carriage (shoulders and buttocks) to the other with great facility.

When kit, great coat, and waterproof sheet, and 70 or 80 rounds are carried as represented in Fig. 14, the kit with sheet is usually carried below; and when such is required the waist-belt is passed through the waist-belt loop of whichever bag contains the kit, and the hooks of the bag are separated to their full extent, while the hooks of the other bag (which is to contain the great coat) are to be placed on the inner side of bag straps, and attached to iron rings of the conjoined braces, and the back-straps of "magazine brace" are then passed through the loops on back of bag.

The waist-belt is next taken, the right end in right hand, and left in left, and buckled (with bag attached) around the waist; and in the same manner the conjoined braces are taken—right in right, and left in left—and the bag and coat thus lifted on to the back of shoulders; the front straps of "magazine brace" are then followed down by the hands, and its ends hooked on to the loops in waist-belt; and the D's in kit brace attached to loops of kit bag; the back straps of "magazine brace" are next buckled at side of chest, and all are on.

*The waist-belt should be open while this is being done.* By catching coat sleeves in each hand and extending both arms, and also drawing on conjoined braces in front of shoulders, every part will assume its proper position, and rest extremely easy on the body. The "magazine pouch" is next attached to front of waist-belt; and water bottle either slipped around on belt, or hooked on to it behind right hip, and the soldier is fully equipped in "heavy marching order."

The soldier can now get at waterproof sheet or any portion of his kit in a moment, by merely unhooking left hook of lower bag from kit brace and moving it round on waist-belt to right front; he can also take great coat from back, and replace it himself *unassisted or without removing accoutrements*, by simply unhooking both braces, and lifting bag off shoulders, and the same can be replaced as already described.

As the soldier is now accoutred he is carrying the two bags—in one of which he has his great coat, and in the other his kit and bread ration. If the latter should exceed a pound in weight, and he should require more, he can easily make room for it by removing the shirt and towel from the kit bag and transferring them to that containing the great coat.

He seldom, however, needs to carry and use the two bags in this manner, as the weight and carriage of the kit is a most useless and unnecessary encumbrance to the soldier on almost all occasions, except when required to march with it from one station to another in time of peace, or carry it to the "base of operations" or the outskirts of an engagement in time of war.

When so accoutred, however, he is prepared for any emergency, and in possession of the same amount of food, clothing, and ammunition as the soldier is when equipped in "Heavy Service Marching Order" in the "Valise Equipment," the ammunition being disposed of as follows: 30 rounds in "expense pouch" in front, 20 rounds in breast pocket of tunic or jacket, and 10 rounds in each of the outside pockets of lower "magazine bag."

But for ordinary daily duties, guards, parades, field days, or active service in the field of battle, the soldier only needs one bag, the other being almost under all circumstances left in the barrack room in peace, or at "base of supplies" in war as a "reserve bag."

On those occasions the great coat is taken out of "magazine bag," No. 1, and suspended on its own "coat yoke," either at the back of shoulders or buttocks—



always the former when the "magazine bag" is required for use. See Figs. 15, 16, 17.

This leaves the "magazine bag" free for the carriage of bread rations, waterproof sheet (at bottom of bag), and from 100 to 140 rounds of ammunition.

The "mess tin" is, under those circumstances, carried either on top or bottom of great coat on "coat yoke," provision being made in mess tin straps for the latter contingency.

The "water bottle" is slung on waist-belt, as before mentioned, behind right hip, and the "magazine pouch" in front of waist-belt; and the soldier is then carrying from 140 to 200 rounds of ammunition, a waterproof sheet, great coat, and a day's rations of food and water. Not more than 140 rounds should be thus carried except when required at siege operations.

When this large amount of rations and ammunition are thus substituted for the weight of the kit they are distributed as follows:—Bread rations in "magazine bag" behind buttocks, meat ration in "meat can" of mess tin over or under great coat, 80 rounds in the centre inside pocket of "bag," and 10 in each side pocket; 10 in each outside pocket of "bag" 20 or 30 rounds in "expense pouch" in front, and 10 in each breast pocket of tunic or jacket. These latter should be composed of strong waterproof material and have their openings sewn up during peace and open in war.

When the soldier has expended all the 60 or 70 rounds he can carry *outside* of "bag," in bag pockets, tunic pockets, and "expense pouch," as specified, and requires more, he has merely to unhook the *left* D, and bring the "bag" round on waist-belt to his right front; when he can either replenish pockets and pouch, or expend ammunition direct from the "bag" itself. (See Fig. A.)

The great coat should have no cape or shoulder straps, and should weigh from 4½ to 5 lbs., and be folded 13 in. wide, 10 high, and 3 in. deep.

When it is carried on its own yoke (Fig. 15) on the shoulders, the back straps of the "magazine brace" are passed between coat and its straps in front, when coat yoke hooks have been hooked on to iron rings of conjoined braces.

The "mess tin" can be carried in six different places, either above or behind "magazine bag," Nos. 1 and 2, or above or below great coat, on coat straps.

The soldier can march with his waist-belt open. The magazine pouch is then transferred to the left side from centre of waist-belt. (See

All accoutrements, kit, coat, &c., can be removed at once by unhooking *right* D of kit brace, and right chest strap, and opening waist-belt, and removing like an ordinary waistcoat.

The "magazine pouch" can be carried in the centre pocket of bags when not required for immediate use on waist-belt.

When blanket, splints, trenching tools, &c., are required to be carried by accoutrements, the straps on "magazine bags" can be utilized for that purpose. The coat, boots, clothing, &c., when wet, can also be carried by the same means *outside* of bag.

#### SOLDIERS' FIELD KIT.—*What it is to contain, and how disposed of.*

Consists of one pair of boots, one pair of summer trousers, one cotton shirt, one pair of socks, one towel, one holdall, complete, containing needle and thread, boot-laces (spare set), knife, fork, spoon, razor, and shaving brush; one piece of soap, one hard brush, and a clasp knife.

Place legs of trousers together, and fold them in the usual way to one-third of their length, which will make their dimensions about 10 inches by 16. Then pack them in bag, front edge upwards, and the flat against proper back of bag. Next roll holdall up carefully (it should contain spare boot laces, needles, and thread) and place it with one sock in one boot, and the hard brush and piece of soap and other sock in the other boot. Then place both boots together (with ankle leather folded down), heel to toe and upper to upper, at the bottom of bag, behind trousers, with the sole of one boot on the bottom of bag, and that of the other looking upwards. Next draw the boots well asunder, to fill all space at bottom of bag. The edge of the trousers, which now appears above the upper boot, should be folded down on a level with it. The shirt is next rolled up hard inside of towel, 15 or 16 inches lengthwise, and packed against proper back of bag, over the trousers. The blacking

tin and small book are placed at opposite ends of bag—between bag walls and contents. The forage cap, when not worn, is carried in the other bag with the great coat under coat yoke straps, and clasp knife in pocket for same near oil bottle in bag.

The meat, as before-mentioned, is carried in “meat can” of mess tin, and the bread and biscuit ration in the loose pocket which either bag has for that purpose.

Should there not be ample room for the bread ration in the lower bag, when the full field kit is being carried there, the shirt and towel are removed from there and carried folded flat in the upper bag with the great coat, as already mentioned.

When coat alone or rations alone need to be carried, the bag or the coat is carried below behind buttocks on kit brace and waist-belt.

My system of equipment is intended to render every soldier independent and self-supporting, and be in every respect his own magazine; and, when circumstances admit of it in the field, and heavy fighting is anticipated; or when during siege operations the soldier needs as much ammunition and food as possible in the trenches, to render him self-supplying, and save both the precarious necessity for hand-carts in the field, or to have men employed and exposed to the enemy's fire while bringing up supplies to advanced posts from the “base of supply,” I propose that the soldier should disencumber himself of unnecessary articles of unnecessary weight, and be his own “magazine,” by divesting himself of such portion of his kit as he does not require for the time being, and substitute—

A waterproof sheet weighing .....	lbs. oz.
And 140 rounds of ammunition.....	2 6
	16 10
Total weight.....	19 0
For the present weight of—	lbs. oz.
Coat cape .....	1 11
Field kit.....	10 12
2 ball bags and haversack .....	1 11
And 70 rounds of ammunition .....	8 5
Carried by the British soldier in action.....	22 7
Proposed weight of articles of clothing, food, and ammunition, which will render him independent of his base of supplies for 24 hours, shows a balance of weight in soldier's favour of 3 lbs. 7 oz. ....	19 0
Less weight....	3 7

I, of course, intend that the waterproof sheet<sup>1</sup> should be used and carried on all occasions instead of the coat cape. It is so much more useful; protecting the man from rain or dew at night, either as a cape or sheet, or (two joined) as a *tente d'abri*; or he can rest on it on damp ground on the halt, or at night; or he can carry and use it instead of the great coat itself in time of peace, to protect him during *wet* but warm *weather* on field days, guard, or while performing any of the duties of a soldier. As an extemporary stretcher or splint-cloth it will also be found most useful for its wounded possessor in time of war.

#### *The Trenching Tool.*

Advantages :—

1st. Can be used with greater efficiency than shovel, trowel, or pick on almost all occasions in the field, and especially grass ground.

<sup>1</sup> This sheet is composed of strong waterproof material; weighs 2 lbs. 6 oz.; is 6 feet by 3 feet 9 inches, and has an oval space 3 inches deep at centre of one of its long margins to fit neck when worn as cape.

It can be carried *rolled*, 17 inches by 3 inches under bag straps at top or bottom of bag; or at back of bag *folded*, 15 inches by 10 inches; or in the coat yoke instead of great coat, when the nature of the *weather* or *duty* render such advisable.

2nd. Acts the part of a measure, shield, spade, and shovel, and will enable the present number of men (125) using picks to be reduced to 40 per 1,000, and spade men replace them on service.

3rd. It weighs 2 lbs. 6 oz. less than the united weights of the present *light pattern* pick and shovel.

4th. Can be carried by every soldier with or without bayonet in ordinary frog, either by the "Oliver" or valise equipment, without alteration in their construction,<sup>1</sup> and be detached for use with great rapidity and facility.

*Method proposed for the Carriage and Use of the Trenching Spade.*

I beg to make the few following remarks regarding the above, not only as to its use and carriage, but respecting the system by which I propose to accomplish both those objects most efficiently; and which is altogether based on the same principle as that of my accoutrements, viz., that of rendering every soldier his own "magazine," self-supporting, and independent of his "base of supply," and as light and free from all unnecessary weight and impedimenta in the field, &c., as it is possible to accomplish. Acting on this principle, I beg to suggest, that the *soldier himself should be the bearer of his own trenching tools*, instead of using the present cart for that purpose.

Trenching tool carts, or pack horses, like ammunition carts, under the enemy's fire, are dangerously precarious in the extreme, as means of supplying men in action with either ammunition or trenching instruments—so liable are the animals drawing them to be killed or wounded, or the carts themselves rendered unserviceable by shot or shell at the critical moment, perhaps, when they are most needed. And, irrespective of this, their transit over roadless, hilly, swampy, or wooded ground, within supply distance of the regiment to which they are attached, may be found almost impracticable, if not quite impossible, and be fraught with the most serious consequences—no tools being within reach when the moment of necessity urgently demands their immediate use.

If every soldier does not carry a trenching tool (which for many reasons would not be advisable) certainly 280 men per 1,000, or per regiment, ought to be within easy access of them; and the tool or tools placed at the men's disposal should undoubtedly be the very best that art can devise for the special service on which they are to be employed.

Two of the different advantages that I claim for my spade are, that it can act the part of spade and shovel, and also considerably reduce the present number (125) of men using the pick. On trial (for light field works) I trust it will be found practicable and advisable to reduce this number to 40 per 1,000, and to place my spade in the hands always of 240 men per 1,000, and often to extend its use to the entire 280—when the use of the pick is not required.

How I propose to accomplish this is as follows:—Instead of having a two-horse cart for the carriage of the tools for each regiment, let there be two two-horsed covered carts, one for each wing, to be called "kit carts," and be for the carriage, on my system, of the kit bags and kits of 280 men. This would relieve each of those men of 12 lbs. 12 oz. of useless impedimenta; and place each of them in the field unimpeded while carrying, 40 of them,<sup>2</sup> 40 picks and handles, and 240 of them—240 spades complete. The weight of each pick or spade complete would be 3 lbs. 6 oz., or 9 lbs. 6 oz. less than the weight of kit and bag; so that each of the 40 pick men could also carry a light hand axe weighing 2 lbs. 5 oz., and 70 rounds; and the remaining 240 a corresponding weight of extra ammunition—90 rounds—and still be 7 lbs. 1 oz. lighter in the field than the English soldier is in "service" "marching order," and carrying, like the pick men, 70 rounds of ammunition. Those

<sup>1</sup> The frog alone requires a slight addition to be made to it; and in the case of the "valise equipment" the two small bag straps may have to be shifted from outside to inside the bag flap to retain spade cover.

<sup>2</sup> The present light pattern picks and handles could be used for this purpose, or these pick heads could be made to fit my spade handles.



280 men would also be in possession of their rifles, bayonets (not sword bayonets), water, food, great-coats, waterproof sheets, and clasp knives; while they each carried those 5 lbs. 11 oz. of useful trenching tools, instead of 12 lbs. 12 oz. of useless kit and bag.

It must be remembered, also, that the 20 extra rounds per man of ammunition to the 240 men will place 4,800 extra rounds within easy reach of themselves and comrades.

The cubic space required in each cart for the kits and bags of 140 men would be 60 cubic feet; and the weight to be carried by each 16 cwt. Those carts would be kept out of reach of the enemy's fire in the "first line" of transport, and be within sufficiently convenient distance of the men themselves.

The tools and ammunition are easily disposed of for carriage as follows:—The spade handle is carried with bayonet in the ordinary frog, and the spade head in front of chest in "cover" as "shield" (see Figs. C, B, D); or by the "magazine bag" behind buttocks, either inside bag or under bag flap on the bag straps, the spade and cover being retained in this latter position by the straps of bag being made to pass through the buckles on the face of the spade cover. Pick handle in frog of waist-belt; pick head inside, or at bottom of bag on bag straps. To equalize the weight of ammunition and spade head:—when the latter is carried in front, only 20 rounds of ammunition should be carried in the "expense pouch"; and when the spade head is carried behind, 30 additional rounds might be removed from the "magazine bag," and carried, 10 in each breast pocket of tunic or jacket, and 10 in "expense pouch" on front of waist-belt. His own common sense will, I trust, guide each man how to act most judiciously in this respect.

With but a slight modification in its construction, the ordinary frog can carry both the spade or pick handle, and bayonet; and the combined weight of handle, bayonet, and sheath is *less* by 7 oz. than the present rifle *sword-bayonet* and *scabbard*. These latter are also  $1\frac{1}{2}$  inches *longer* than my spade handle; and, therefore, in rifle regiments, the 280 men per 1,000 employed as "trench men" should be armed with bayonets instead of swords.

When the moment for action occurs in the field, those 280 men can be in readiness for work with their tools,<sup>1</sup> *by this system, in less than one minute*; and if they should be suddenly surprised at their work by the enemy, or want to retire or advance at a moment's notice, they can, almost instantly, place themselves in a state of defence, and in possession of their rifles, by reversing the handles in spades, and carrying them, thus slung, on front of waist-belts.—See Fig. D.

I would also beg to recommend that the 280 "trench men" per 1,000, should receive special instruction in the construction of field works, &c.

In conclusion, I beg I may be excused mentioning and suggesting, that, if my propositions regarding the "trenching tool carts" were also extended to the "regimental reserve ammunition carts," 420 more men per regiment could be relieved of their kits and kit bags; and, in lieu thereof, could each carry an additional 70 rounds of ammunition; which would make a total of 29,400 rounds extra, and would amount to no less than 600 more rounds than the whole three ammunition carts carry at present—while the actual weight of the extra 70 rounds of ammunition per man would only be 8 lbs. 5 oz., as compared with the 12 lbs. 12 oz. of kit and bag from which each would be thus relieved.

When war is localized, and there are standing camps, and a fixed "base of operations," whole regiments can almost constantly dispense with the necessity of carrying their kits and "kit" or "reserve bags," and carry in their *second* magazine or "service bag" to the "front," an amount of food, ammunition, and necessary clothing sufficient to render them independent of their "base of supply" for twenty-four or forty-eight hours.

W. S. OLIVER, M.D., F.R.C.S.I., *Surgeon-Major*.

<sup>1</sup> My bag, being transferable in a moment from *back* to *front* of waist, enables the spade head to be carried in or on it behind buttocks within easy and immediate reach for use. This the Government accoutrements do not admit of; and consequently the spade head is best carried by them in front of chest.



Rear-Admiral J. H. SELWYN: This being principally a military matter I should have preferred to have waited for my brethren of the other arm, but, as my name has been mentioned with regard to the attachment of the spade to the rifle, I will advert to that and to one or two other points. I will only say that in the Navy our opinion of the accoutrements of the military branch has been for many years so bad, that we consider the best thing a Marine can do, at the double, is to take his rifle under his arm, put one hand to his cartridge box, and the other to his shako, in order that he may lose neither of them. I have very long had a high opinion of the Rice trowel-bayonet as a means of rapidly entrenching troops. No doubt the recent occurrences in Turkey have shown us the extreme value of even hastily thrown up entrenchments under modern attack, and more attention must necessarily be conceded to the subject. But, I object first to that fact, that although the moral effect of a thing which will nearly cut you in two may be very considerable, yet, the value of a point and the length of that point was very clearly shown by the lecturer, when he spoke of the different lengths of the old Enfield arm and its bayonet, and the modern Martini-Henry without its sword-bayonet. No doubt the original idea was that the sword-bayonet added to the length of the Martini would be equal to that of the old weapon, but, as we have had to give up the sword-bayonet, we have lost the length which was of value. Incidentally we lost also the weight of the arm which prevented the kick sure to be given by a large charge. The bayonet (as well as the lance) has been called the "Queen of Weapons," and Marshal Suvaroff said that the bullet was a fool and the bayonet a hero; I, therefore, do not like to see it done away with, and I think it is still useful. At the last attack at Chipka, there was a ten minutes' combat between the rival infantry with the bayonet. It seems to me that the trowel-bayonet could be very well carried on the outside of the stock of the rifle without increasing the weight. A certain portion of useless wood would be taken away, and the soldier would then have an entrenching tool and also his bayonet without increased weight or complication.

With regard to the question of the calibre of the revolver, some time ago I went to the War Office to bring to their notice the Smith and Wesson revolver, which I had seen largely used in America, and which is a very efficient weapon. I was told, first, that a double-barrelled breech-loading pistol had been sealed for use; and, secondly, that the instructions issued prevented any cavalry soldier using his firearms for any other purpose than signalling. That was a sufficient answer for me and I left the subject. Now, I am happy to hear that a revolver has been sealed for certain modified use in the cavalry, but the great error the lecturer pointed out is, that with the one weapon your bridle-hand is not used at all, with the other weapon you must take two hands and pick out every cartridge after you have discharged it. With the American revolver you throw out the cartridges by a simple movement which leaves the chambers exposed and which does not throw out any cartridge you may not have discharged; with the other you have to take out a ramrod, turn it round, and then force out each cartridge. You may imagine what sort of an operation that would be in a *mêlée*. The calibre of the bullet has been increased. This is an unmitigated benefit in one respect, that it does give a bullet capable of stopping a man at once, but it has its disadvantages; you must either give a larger charge to the same bullet, by reason of its increase of weight, if you keep the same proportion between the length and diameter, or you must have a bullet which is too short to give the best results. If the bullet be increased in weight, and you want more than the 23-grain charge, which is sufficient in the Smith and Wesson revolver, I hear the present charge is only intended to be 15 grains, or you must shorten the bullet, and then you get less accuracy. Between these two dilemmas, I should prefer a moderate charge of powder, a lessened range, and greater stopping power, but it is essential to have a weapon which does not require the use of the bridle-hand if you are to have a weapon efficient for cavalry. I have had considerable experience in the West of America, where they are very fond of using the revolver, and where these matters are attended to very closely. The pull-off trigger is a great improvement over the American pistol, and it is that which has induced the Americans in California to call the English pistol the English bull-dog. With regard to the proportion of the powder to the bullet, and the weight of the case, you will find that in the simple metallic cases, without any mixture of two metals,

the Americans have avoided some very difficult points which still exist with our own ammunition, and, as you improve breech-loading arms, you not only use more ammunition, but you are obliged to have more of it in stock. Anything that bears on this point is of very great importance. Our present cartridge is made up of iron, lead, powder, brass, and paper; the American cartridge has nothing in it but brass. The English cartridge has a bell, cup, an anvil, a detachable iron disc, and a fulminating cap. An American cartridge has nothing but the one fulminating cap. This is simplicity, and that is its value. Now let us look at the weight. The Daw cartridge (which received a prize in this country before the American cartridge was generally known) weighs ten per cent. less than the English cartridge as it stands at present, that is to say, you get on the 100 rounds 10 rounds more with the same weight. The English cartridge again, when kept in store, by the galvanic action between the iron and saltpetre destroys its own case. The American cartridge does nothing of the kind. It is worth while to look at all these things before we find them out in actual practice. I should have said I quite recognize the advantages held out by Colonel Rice, in giving the soldier an efficient tool for all purposes, such as cutting brushwood and other things, which we cannot do with the bayonet attached to the stock; but still, I think, if you put a thing to too many uses, you are very likely to have some of them inefficiently performed. In the latest development of an American magazine rifle, which has been exhibited here for the first time, it has not yet been shown in England at all, you have remarkable simplicity, great power of firing without taking the weapon down from the shoulder, and the perfect balance of the weapon, which we have sought in vain in other rifles. It is quite true when loaded as a magazine arm it weighs more, but when you want to use the magazine such considerations disappear altogether. When you use the weapon for accurate firing at long ranges, you do not use the magazine and the weapon retains its normal weight; but when you want to shoot half-a-dozen cavalry soldiers one after the other, without taking the arm from the shoulder, you do not care whether the weapon is a little lighter or not, provided you can accomplish that object. I can only congratulate the author on the comprehensive way in which he has treated those few subjects amongst all he has referred to with which I am acquainted; I can only hope other Officers connected with other subjects will have reason to say as much as I have great pleasure in doing. I must congratulate the Institution on a most valuable paper.

Captain the Hon. H. G. CRICHTON, 21st Hussars: I can show best by unpacking the kit how simple the arrangement of it is. I have found it necessary to make certain alterations since I first commenced which do not alter the principle but only the details of the equipment; these alterations I had arrived at by watching the trials which took place last summer. The numnah now could be made of felt or leather, and there were no stitches or rivets next to the horse's skin, which were necessary in the way I at first constructed the numnah. The front and hind parts of the numnah are made self-supporting by thin pieces of sheet steel, which make the saddle independent of the numnah and the kit attached to it. The saddle has been made longer so as to give the man more room in it, and the side-boards are closer together, so as to keep it more off the back since it is ridden without panels, and can also be ridden without numnah in light order.

I look upon the blanket as infinitely preferable to the panels. As to begin with, the former is useful for covering the horse when standing out in cold weather, and every time it is refolded it is like re-stuffing the panels, which always will in time, and with no opportunities of re-stuffing, get as hard as a board; the danger of the blanket when it used to be worn under the saddle was, that if carelessly folded it became wrinkled, or gravel perhaps remained on it when folded on the ground; and, above all, it was sure to slip back from under the saddle, the grain of the horse's hair causing this. In my equipment, the two former dangers are very much lessened, as there is a layer of felt and leather under the blanket, and the third is altogether obviated as the blanket does not touch the horse's skin in any place, but lies on top of the numnah between the front and hind part.

The sheep-skin which covers the regulation saddle of course adds very much to its appearance, but occasionally it covers a multitude of sins in the way of a badly packed kit beneath it. I could equally well cover mine with a sheep-skin, but I

think a waterproof sheet for the man to lie down on in camp or bivouac, with two pockets for his kit, and made like this one to roll up into a pocket at the end, is infinitely more useful, this being made of strong waterproofed canvas keeps the kit in it dry, and is packed on the hind part of the numnah, the front part is kept dry by a waterproof horse-cover like those at present used in camp. These two very necessary waterproofs are thus always with the horse instead of being carried in the waggons, where they are so likely to remain if cavalry are pushed to the front, and their combined weight is about the same as that of a sheep-skin.

I have made my new numnah the same shape in front as behind, so that it can be reversed and the pressure on it will be in different places according to which way it is turned, and it is not so liable in this way to get hard in one particular spot where the greatest pressure is.

The water-bucket, which is fastened to the shoe-case and shaped like a sabretache, is intended for use in places where the banks of canal or river are too steep or too boggy to allow the horses to walk into water; also it frequently happens in camp that the carts with buckets, &c., are late in arriving, and the men at a standstill for want of something to draw water in to clean their equipments; under these circumstances I consider a bucket of this description very essential.

The lecturer remarked that the question of leather or felt next to the horse was a moot point, it certainly is a very important point, and one that requires a great deal of consideration in settling. The felt I think requires a great deal of care, and is often rubbed, scrubbed, and beaten into holes before very long, if not backed by something strong, it also requires sun or fire to dry it; the leather merely requires to be sponged over and kept pliable with oil, fat, or soap, and does not require sun or fire, but the leather ought to be backed by something soft. I also think that the felt when too great pressure comes on it rubs up and stretches the horse's skin, which wrinkles it, and matter forms under it, which causes a much worse description of sore back than leather, which rubs the hair off without stretching the skin: under these circumstances I am inclined towards the leather in preference to the felt.

Captain APPLIN, late commanding H.M.S. Legation Guard, Japan, and late Military Train: With your permission I should like to make one or two remarks. With regard to the pistol, I think that Admiral Selwyn is perfectly correct. My opinion is that the quantity of powder used is a great mistake; it is considerably too strong a charge. Using a pistol, no man should fire certainly at a greater distance than twenty paces on any consideration. Some six or seven years ago in Japan it was necessary for every man to carry a pistol, but the Japanese invariably got the better of every man carrying one, even when he had it in his hand. The fact is, the Colt revolver is the very worst weapon you can possibly have, for after being loaded a week, probably not more than one of the whole five barrels is useful. I have seen sixty men armed with these revolvers, of which not more than three-fourths were of any use. I very nearly lost my own life through the inefficiency of this weapon. For the breech-loading pistol the charge is also considerably too strong. You do not want *penetration*; what you really require is a breech-loading pistol which can be easily loaded and unloaded, and will carry a bullet heavy enough to stop a man. Then with regard to the sword and lance, there is no doubt the lance is an effective weapon, but it is very easily put on one side. I think in a charge against infantry it is effective, but I do not think it is so against cavalry. A man of nerve, a well-trained soldier, might very easily put the lance on one side. I maintain the great fault in our swords is that they will not cut. Use them as much as you like, unless you have them specially sharpened the night before, they are useless; and then we do not use the point of our swords as we should. The most effective part of the weapon in the hands of a good cavalry soldier is the *point*, and you will see this at once, because you have to raise your arm into all sorts of positions for the cut. In the cut our swords are useless in nine cases out of ten, as was shown in the Crimean War. Then with regard to saddles there can be no question of the vast improvement made by Captain Crichton. There is no doubt that the Indian numnah is far preferable to anything that has ever been invented yet. I have taken my troop sixty miles in ten hours without a sore back, or the loss of a shoe, over rough country. Some of my men rode 22 stone, and the horses were only



14 hands 2 inches in height—little Arabs. I did not do this only once, but I was constantly doing it for seven years with the same horses. When I left, they were from twenty to twenty-two years of age, and I never had a sore back during my command, always using the Indian numnah. I think that is good proof of their utility. I cannot refrain from repeating that something should be done with regard to the sword exercise in our cavalry, so as to do away almost entirely with the cut. You might have the weapon two or three inches longer; and I am sure any practical man who has gone through one or two campaigns will see the advantage of using the point rather than cutting. The Japanese use two-handled swords; if we could use them, I should say *cut* by all means, for they never want a second cut. With regard to the small bullet and great penetration, I remember that in one case after a man had been shot through the chest with two bullets from a *Cott's* revolver, he succeeded in killing two men, giving one man sixteen wounds, every one of which was death. This I saw with my own eyes, and I brought in the man myself. There is no weapon equal to the breech-loading revolver in the hands of men who know how to use it; and as to the sword I certainly prefer it to the lance.

Lieutenant WALTER H. JAMES, R.E.: There is one point I have not heard touched upon, viz., the question of a forage cap. In the British Service we have, roughly speaking, two patterns, that worn by the Guards, the cavalry, the Engineers, and the Artillery, and the "line" forage cap. To my mind, neither of these fulfils the requirements of a proper forage cap, and neither of them on service would be of any use at all. The infantry forage cap is too small: it does not cover the head, it may have what we call a soldier-like appearance, but it would be quite useless on service to protect the head from the weather. The same objection holds good with regard to the other pattern, it goes to pieces in a very short time, and does not cover the head. But we have in the well-known forage cap that the Guards used in the Crimea the elements of a good cap, and I must say it is one I should like to see introduced throughout the service. On the question of the bayonet, Admiral Selwyn has, to my mind, hit the nail on the head, when he said that the "Rice" bayonet would not fulfil every purpose. If it be used as a digging weapon, it will certainly fail as a cutting weapon and as a weapon of attack. With regard to the length of the Martini-Henry, the question of the use of the bayonet has, to my mind, been somewhat exaggerated. We are told that only one per cent. of the casualties in the late war were caused by the bayonet, and that is the very reason, to my mind, why we should not have a weapon as we had in the old Enfield, which was cumbersome by its length, simply for the purpose of having the bayonet at the end of it. When the Martini-Henry rifle was first introduced I shot with it myself, and saw a great deal of shooting with it. I confess I utterly failed to discover that it kicked to any great extent. Certainly the recoil was not more than that of the Snider-Enfield, and I believe that the opinions of a great many first-rate shots in the regiments to whom it was issued coincided with mine.

NOTE.—The lecturer objects to the Martini-Henry, firstly, on account of the spiral spring, and, secondly, on account of the divided stock, which he states increases the recoil and renders the breech difficult to shut in a variable climate.

With regard to the first objection, I may observe that France, Germany, Russia, Italy, and Switzerland use spiral springs, and that the campaigns of 1848 (Baden Insurrection) 1864, 1866, and 1870—71, have proved most conclusively that locks constructed on this principle are quite capable of withstanding the trials of war. So far from being unmechanical, the testimony of such eminent mechanicians as Professor Pole, Mr. Nasmyth, and Mr. Woods was distinctly in favour of the spiral as opposed to the flat spring for the purpose required of it, while the wide-spread use of Salter's spring-balances shows that, so far from being uncertain, spiral springs are most accurate and reliable in their working.

With reference to the second class of objections, it is a mechanical impossibility that the old stock could absorb any of the recoil by its elasticity. The recoil is transmitted directly to the shoulder, which, being elastic, yields to it. In order to absorb a portion of the recoil in the stock, it would be necessary to construct it of a material more elastic than human flesh and muscle. Such a material, I need hardly point out, would scarcely possess the other requirements of a military rifle stock. As to the contraction and expansion of the stock, if it be constructed of well-



seasoned wood it ought not to be so much affected by atmospheric changes as to render the lever difficult to close. At any rate, this objection would apply equally to an undivided stock, and is at the worst easily capable of remedy.

The Martini-Henry rifle has, in the present war, given proof of its capabilities, and shown practically, what those who have theoretically investigated the matter knew before, that it is a first-rate infantry weapon, and that armed with it our troops possess a rifle, which, in regard to ballistic qualities, flatness of trajectory, range, accuracy, and penetration, is superior to any in Europe.—12/2/78.—W. H. J.

Surgeon-Major OLIVER made some remarks on entrenching tools and how to carry them; but as a full account is given of these particulars in the appendix to the lecture, his remarks are not given here.

Lieut. GRAVES: I have to thank you for your kind attention to my lecture. With regard to the trowel-bayonet, I quite admit it is too short to be an effectual weapon when compared with the sword-bayonet, but if the moral effect is maintained, I think we may leave the actual effect to take care of itself. It is meant to be used in the hand simply, in a kneeling position, and not attached to the rifle when digging. Then, again, with the implement at present in use, the men will take fifty minutes to get the same cover as the trowel-bayonet will give them in six minutes; therefore, I maintain, we should have a tool to be carried by the man which will give cover in the shortest time.

With regard to the charge of the revolver, I believe myself that ten grains of powder would send a bullet that would stop a man with quite sufficient final velocity, and do quite as much as the stronger charge of powder with a smaller bullet. It is not a projectile for piercing that we want, but rather something that will stop the man. We have just heard from Captain Applin about the Japanese man who, after receiving two bullets in his body, did such execution amongst his enemies. The fact was, the bullet was too small to stop him. It most probably went right through him. What we want is something which will actually stop the man and incapacitate him from work. With regard to the length of the Martini-Henry rifle, I cannot quite agree with the observations which another Officer has made, because by giving up the length we have actually lost the flat trajectory that is so much needed. We do not have the same final velocity that we had when the longer barrel was used, and that is what we want. We want the greatest possible final velocity at the greatest possible distance. The short rifle does not give us that velocity, to say nothing of the disadvantages connected with it when the man is standing at the order. With regard to the numnah, three years ago I proposed that the saddle should be made without panels, so that it should require no stuffing, but should be made simply with about three inches thickness of numnah covered with leather. This would fit to the horse's back at any time, supposing the panels were not made with the unyielding substance of which they are now made, and it is now a moot point which is the best plan. With regard to the Oliver equipment, there is one thing I ought to have drawn special attention to; it is this: that with it the man can always have his hand upon his ammunition. We have a very small army, and the chances are that we shall never be engaged with a Continental power, except on the defensive, and we want to have the man's hand so continually on his ammunition that he may be able to fire with the greatest possible rapidity. We want something to enable a man to carry about 170 rounds of ammunition, and to use it as quickly as he chooses. The Oliver equipment for an infantry regiment of 1,000 bayonets carries 72,000 rounds of ammunition more than the present system. Captain Applin has said that there was very little effect from the revolver in the Japanese war. What was the reason? In the first place the bullet was too small, and in the next place the revolver had not a pull-off action. The weapon His Royal Highness has chosen for the Army is one of large calibre, and with the pull-off action, so that a man can shoot as quickly as he can pull his finger. If a lot of men get into a *mêlée*, armed with this revolver, by the time that the men have got to the end of their magazine the fight ought to be pretty well over.

A question was asked by another Officer about our forage caps. His Royal Highness the Duke of Connaught at the same time that I proposed my jacket, which is now on trial, brought forward this cap (Fig. 20) for the Hussar regiments on service.

There is a similar cap, having a different ornament, for the lancer, and another for the heavy dragoon. I think it gives everything that is wanted, and this is the sealed pattern which has been placed at my disposal by the Assistant Adjutant-General. I have to thank you for the kind attention which you have given to me.<sup>1</sup>

The CHAIRMAN: There are one or two points I noted during the course of the lecture, which I perhaps might draw attention to. I think the lecturer made some slight mistakes in his figures. First with reference to the proportion of guns. He stated that in some armies at the present moment the proportion of guns was 8 to every 1,000 men. I think he is wrong there; because, if I am correctly informed, I think the proportion of guns laid down, according to regulations for our Army, comes up to quite the same proportion as that established in the German Army, namely,  $3\frac{1}{2}$  or  $3\frac{3}{4}$  for every 1,000 men. The next point is about revolvers. A good deal has been said upon that subject, and I fully concur in the remarks which have been made. I certainly agree with reference to the advisability of giving the revolver to artillerymen. At the present moment an artilleryman is really in the most defenceless condition: for if his battery is charged, unless he uses his hand-spike, he has actually nothing to defend himself with. Every gunner should be furnished with a good revolver. As to the size of the revolver, what we want is one carrying a heavy bullet. We do not want a weapon that will kill a man at 100 yards. One gentleman said 20 yards, but nothing would ever induce me to use a revolver at a greater distance than 10 yards. If the pistol is only required for use at very short distances, I think you can very easily reduce the length of your revolver-barrel, which is at present usually too long; by doing so you would make it more handy for use on horseback.

With reference to the question of dress, I think the lecturer has hit several very serious blots existing at the present moment. Our men are dressed for parade, for appearance, for show, and for theatrical effect instead of for work. What gentleman at the present moment in England when he goes out shooting would go dressed in the absurd dress in which a soldier is sent into the field to fight? If we go hunting, shooting, sporting, walking, climbing, or on any kind of wild excursion, we dress for the occasion. Our clothes are made very loosely, and full play is given to all our muscles; but the unfortunate soldier is tied up in a manner that is most unpleasant to him if he has to make use of very great exertion. My experience of a soldier is, that the first thing he does is to take his coat off, and either work or fight in his shirt-sleeves. As far as one can see from general common practice in England, the Norfolk jacket seems to be the most practical dress. A great number of Volunteer regiments have adopted it, and I think most wisely.

With reference to boots, I think the lecturer did not lay sufficient stress upon the fact that people who ride most prefer the long boot with breeches. For the infantry soldier it is different, although the Russians themselves, who are about the best marchers in the world, march in long boots; but I think indisputably for all mounted branches of the Service, long boots and breeches are the best as well as the most comfortable.

Upon the subject of our infantry dress I have two or three remarks to make. First, as to the Oliver equipment, I shall not go into any detailed accounts of it. I am very glad to see it is now going to be very freely tried in the Service. One or two regiments are going to be equipped with it, and in my opinion the sooner it is adopted the better. There are several very excellent things about it; one, by no means the least striking, is the absence of pipe-clay. I think, if there is a monstrous absurdity in the Service, it is the use of pipe-clay. Why you should send a man into the field, where he will have to sleep out of doors exposed to all sorts of

<sup>1</sup> I must add that when I spoke of the American cavalry, I did not mean to compare them with our cavalry as such. I wanted to direct special attention to the results obtained by the use of a certain class of armament. If mounted infantry who were bad riders, but armed with revolvers, gave such a handsome account of regular cavalry who were only armed with the sabre, as in the instances quoted by me in the body of my lecture, how much more necessary it is, therefore, to supply the front ranks of our cavalry all round with revolvers. The writers from whom I have quoted are Jomini, Marmont, De Brae, Woemer, Cromwell, Napoleon, Havelock, Trower, Denison, and Elliott.

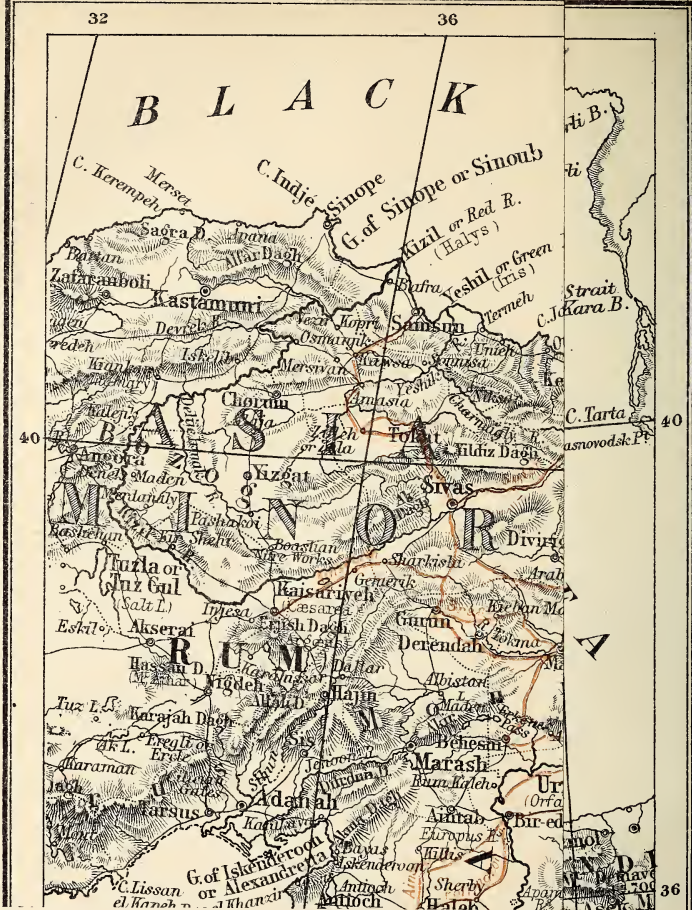
weather, dressed up like a scare-crow with white stuff all over him that falls off on the first shower of rain, dirtying his boots and clothes, I cannot understand. I am glad to see in the specimen of the Oliver equipment before us to-day that all the straps are of the natural colour of the leather.

With reference to what has been said regarding the Martini-Henry, I am very sorry I do not know enough about rifle shooting to be able to give any decided opinion. The question, however, put before us by the lecturer, and also by Admiral Selwyn, as to the cartridge, has struck me very recently. The American cartridges are made stamped in one piece, and ours are built up in a complicated way. I regret that no gentleman capable of speaking on the subject has explained how it is that the style of cartridge we have in use has continued so long. As to the shortness of the rifle, I do not share all the objections which have been put forward by the lecturer on that subject. I think the days when men prodded one another with bayonets are past and gone; and I therefore think you should look at the rifle as a thing that shoots, and not as a thing with a bayonet at the end for the purpose of killing with. If the short rifle shoots as well as the long rifle, I think the former should have the preference. The lecturer, however, said the trajectory of the short rifle was not as good as that of the long one. I never heard that before, and I hope he is misinformed. With reference to the bayonet, I certainly have a very strong opinion; as I have just said, I do not think it should be simply regarded as a weapon to kill with. It is, doubtless, necessary to have it for the moral effect, and as you must therefore carry some prodding weapon at your side to put on the end of your musket when you require it, it is very desirable it should be something you can turn to some other use as well. The trowel-bayonet was used in America many years ago during the war; but I do not entertain the very high opinion of it that has been expressed by the lecturer. As a rule, I do not think that things that are intended for so many purposes, generally answer any; and the trowel-bayonet, after being used some time for digging, would be of very little use I think for any other purpose whatever. As one gentleman said it certainly would not cut, and I very much doubt if it would last long as a digging-tool; I have seen experiments, carried out with it; to dig a hole large enough to get into, with a trowel whose handle is only six inches long, is a very break-back job. There is a bayonet which will cut and saw wood or meat, and that is the Elcho bayonet. This was at first adopted by some regiments of Volunteers. I saw it used on several occasions, and I must confess that, to my mind, it is one of the most valuable weapons I have ever seen. We used it during the Ashantee campaign, where it was invaluable. You could cut small trees down with it, and it is an efficient and handy weapon for all purposes on the field. I have only one other remark to make, and that is with reference to the lecturer's allusions to the use of cavalry. He quoted the observations of Colonel Denison, and also a work of Sir Henry Havelock's on the subject. Now, Colonel Denison is a very excellent Officer, and a man who has studied the profession most earnestly; but he does not, I think, appreciate fully what real cavalry can do. He has a very intimate acquaintance with cavalry as they existed in America; but I wish to impress upon all here one fact with reference to the use of cavalry during the war in America. It is this: that neither on the Federal side nor on that of the Confederates, had they any regular cavalry at all. They had men on horseback, but they were not cavalry soldiers as I understand cavalry men. They were mounted infantry, and simply mounted infantry: that is, they were infantry soldiers put on horseback. I saw a little of both armies in that war, and as regards the Northern cavalry nothing could be worse; they were very bad horsemen, indeed, in the European acceptation of the term, they certainly were not cavalry. The great feats that we heard of as performed by the American cavalry were really done by mounted infantry. The remarks on the Confederate war, made by Sir Henry Havelock in his book on this subject, were made before he had been in America, or he would not have fallen into the common error of referring to Virginia as a country of plains suited to cavalry. Now, my experience of Virginia is that there are few places where a squadron could charge for 500 yards, as it is a wooded country with numerous fences. I think, ladies and gentlemen, we have had a great deal of very valuable information imparted to us both by the lecturer and by those gentlemen who have taken part in the discussion, and in your name I beg to tender them our cordial thanks.



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# THE KURDISTAN MOUNTAIN RANGES, CONSIDERED IN REFERENCE TO A RUSSIAN ADVANCE ON THE TIGRIS VALLEY.<sup>1</sup>

By Lieutenant-Colonel RALPH E. CARR, 36th Regiment.

## PART I.

### *Index of Routes.*

No. 1. Mr. Brant.	No. 10. Lord Pollington.
„ 2. Mr. Taylor.	„ 11. Colonel Shiel.
„ 3. Ditto.	„ 12. Mr. Ainsworth.
„ 4. Ditto.	„ 13. Mr. Layard.
„ 5. Mr. Brant.	„ 14. Mr. Taylor.
„ 6. Paul Lucas.	„ 15. Mr. Layard.
„ 7. Von Moltke.	„ 16. Mr. Layard.
„ 8. Mr. Taylor.	„ 17. Mr. Ainsworth.
„ 9. Mr. Brant.	

At a time when the attention of military students is directed to the movements of the opposing Russian and Turkish armies in Asia Minor, a fitting opportunity presents itself to examine, by the aid of the map and by the experience of travellers, the serious nature of the obstacles likely to be opposed to the further progress of Russian arms towards the Tigris and Euphrates Valleys.

I must here disclaim all pretension to offer to the frequenters of the Royal United Service Institution information which they can obtain by reference to the travels of which this paper is mainly a compilation, but my object has been to bring within a small compass the experience of a number of travellers, for the benefit of those members of the Society, and of the military profession generally, who, being scattered in remote stations, have not the command of works of reference, some of which have long ceased to be in general circulation; as the exploration of the mountains of Kurdistan (which was carried on with considerable energy in the earlier half of the century) seems, with the exception of Mr. Taylor's, Baron Von Thielman's and lastly Captain Burnaby's contributions, to have been almost discontinued since the Crimean War.

The great mountain system, extending in almost unbroken continuity from Iskanderoon on the Mediterranean to the Persian Gulf, has (hitherto) perhaps derived its chief interest in modern times from its bounding to the north the rich plains of Mesopotamia, and from its slopes being drained by, and supplying the sources of, "that great river, the River Euphrates."

It seems now destined, within the lifetime of the present generation, to attract the notice both of the statesman and of the soldier, from

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<sup>1</sup> This paper was chiefly compiled in 1877.—ED.





**A MAP**  
to illustrate  
**LIEUT. COL. CARR'S**  
paper on the  
**KURDISTAN MOUNTAIN RANGES**

The Roman numerals attached to the routes refer to the 'Index of Routes' at the end of the paper

# THE KURDISTAN MOUNTAIN RANGES, CONSIDERED IN REFERENCE TO A RUSSIAN ADVANCE ON THE TIGRIS VALLEY.<sup>1</sup>

By Lieutenant-Colonel RALPH E. CARR, 36th Regiment.

## PART I.

### *Index of Routes.*

No. 1. Mr. Brant.	No. 10. Lord Pollington.
" 2. Mr. Taylor.	" 11. Colonel Shiel.
" 3. Ditto.	" 12. Mr. Ainsworth.
" 4. Ditto.	" 13. Mr. Layard.
" 5. Mr. Brant.	" 14. Mr. Taylor.
" 6. Paul Lucas.	" 15. Mr. Layard.
" 7. Von Moltke.	" 16. Mr. Layard.
" 8. Mr. Taylor.	" 17. Mr. Ainsworth.
" 9. Mr. Brant.	

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its position between the tide of Russian advance and the waning power of Turkey.

In order to condense as much as possible the information afforded by a number of authorities, I have thought it more satisfactory to quote verbatim from each some of the most instructive passages bearing on the lines of communication and the relation between the several sects, even at the risk of wearying the reader by a series of extracts.<sup>1</sup>

While avoiding as far as possible the temptation to follow the authors into subjects of general interest, I trust that the references here given may perhaps assist some of my readers to study for themselves the physical geography of a country likely to play an important part in the history of the East.

I propose first to confine my attention to the western half of the range comprised within the present limits of the Turkish dominions, and therefore more directly affected by the course of the war now raging.<sup>2</sup>

In considering this subject, it is here assumed that the war has brought such successes to Russia, that Erzeroum has been occupied, and her frontier, or the territory under the command of her armies in Armenia, has advanced so far as to be represented by a line drawn from Trebisonde on the Black Sea, including Gumish Kaneh, and Baibut, but leaving Erzingan to Turkey; then crossing both branches of the Euphrates to the mountain range which forms the southern boundary of Lake Van, and so on to the Persian frontier near the head waters of Zab-Ala tributary of the Tigris.

All this country, except the basin of Lake Van, was overrun by Marshal Paskiewitch in his brilliant campaign of 1829; and should it again fall into the power of Russia, it can scarcely be supposed that the large Armenian population will ever be handed back to the tender mercies of the Turk.

Once again in possession of Erzeroum and Bayazid on the bleak highlands of Armenia, Russia is not likely long to withhold her grasp from Van, the acquisition of which territory is of obvious strategical importance, as carrying her forward at one step 200 miles to the southward and securing as an outpost, from which to choose her own time for the next move, one of the most favoured districts of Asia, the reputed cradle of the human race, and unrivalled in fertility of soil and salubrity of climate by any part of the world.

The far-famed vale of Cashmir, perhaps, approaches nearer than any other district to the following description of Van by Major Millingen, who commanded a Turkish force on the Persian frontier at Kotur after the Crimean War.

("Wild life among the Khoords," by Millingen, p. 152).—"Nature has been liberal in its gifts to the District of Van, having endowed it with all the elements

<sup>1</sup> It will be seen, from the same proper name being often spelt in two or three different ways, that I have retained, in each case, the orthography adopted by the author in the original.

<sup>2</sup> Written 16th January, 1878.

which can ensure prosperity and abundance. Its climate is mild, the severe winters which visit Erzeroum being unknown here. The thermometer rarely falls to 14° Fahrenheit, whereas the utmost heat does not reach higher than from 86° to 95° Fahrenheit in the sun.

"The soil is fertile and capable of producing anything . . . .

"The apple, the pear, the cherry, the apricot, the fig-tree, the vine, abundantly supply the country with their fruits; while the shade of the lime-tree, the willow, poplar, elm, and mulberry protects it against the heat of the summer. All the varieties of vegetables which are to be found in the kitchen-gardens of Constantinople are, with one or two exceptions only, supplied by the gardens of Van. Wheat and barley are plentiful in the districts surrounding the lake . . . .

"The flocks of numberless sheep, bred by the Kurdish shepherds, not only supply the country with meat, wool, butter, and cheese, but also provide the larger markets of Asia Minor, Syria, and Constantinople with the means of subsistence."

Although by the scope of this paper we are only directly concerned with the communications from Van to the southward, it may not be out of place to mention here that Mr. Brant passed over the Ala-Tagh Range in 1838, and past the sources of the Murad Su Euphrates, by a steep ascent and an almost precipitous descent through Diyadin to Byazid; and that Texier reached the latter town from Van by a route more to the south.

A recent and important addition to the geography of the Van basin is found in Captain Burnaby's journey last winter from Ardish, on the northern shore of the lake, over the eastern spurs of the Sipan Dag Mountain to Patnos on a tributary of the Murad Su Euphrates. Thence, avoiding the more beaten track by Malazgerd, he passed by an hitherto unexplored country, ascending the course of the Murad Su through the Ala Dag range to the main Erzeroum and Bayazid road, where he narrowly escaped paying the penalty of his enterprise with his life from an attack of fever.

Van has also direct communication with Persia through Kotur and Chöi, which route has been followed by Texier, Major Millingen, Colonel Shiel, Captain Burnaby, and Dr. Otto Blau. The latter, however, diverged from Kotur southwards to Dilman by a comparatively easy road, past Chani, or Chanzi, at the sources of the Zab-Ala.

From thence he mentions that the most direct, but most difficult, road to Van leads, through a country hitherto unexplored, to Choshab. There it joins the route taken by Mr. Layard from Bash-Kala, in 1850, as hereafter noticed.

After this digression, I will now ask my readers to accompany me on the map along the main road from Erzeroum southwards, which leads through Cnys, or Kenys, the most southerly point occupied by the Russians in 1829, to Mush, the capital of a Pashalic near the Murad Su branch of the Euphrates, and thence close past the shores of Lake Van to Bitlis. The road then passes out of the basin of Lake Van, through narrow defiles, which will be treated of hereafter, to Til on the Tigris, and it has formed through all ages one of the chief trade routes from Trebizond on the Black Sea, to Mosul or Nineveh on the Tigris.

Mr. Layard thus describes the route to the north of Bitlis:—

"Here and there the ruins of a fine old khan, its dark recesses, vaulted niches and spacious stalls, blackened with the smoke of centuries, seemed to mark one of the

great highways leading in the days of Turkish prosperity from Central Armenia to Bagdad. We had crossed this road on the plain of Hinnis (Chynys). It runs from Erzeroum to Mush, and thence to Bitlis, leaving to the east the Nimroud Dagh, which separates it from the lake of Van. Commerce has deserted it for very many years, and its bridges and caravanserais have long fallen into decay; when, with the restoration of order and tranquillity to this part of Turkey, trade shall revive, it may become once more an important thoroughfare, uniting the northern and southern provinces of the empire."

These khans attracted the special notice of Mr. Brant, who thus accounts for their number on this route ("Journal of Geographical Society" vol. x, p. 379):—

"In the course of our descent to Bitlis we met several large khans of very solid construction, but in a ruined state, and so near each other that I was at a loss to imagine the reason, until I learned that in winter in this pass the wind often rushes through the valleys with fearful violence, and, when accompanied by snow, endangers the lives of persons on the road, for advance or retreat are then equally impracticable. The khans were built to afford refuge to caravans or travellers caught in these storms, and the peasantry were bound to resort thither on the approach of bad weather, to be at hand as well to give assistance as to furnish supplies during the detention of persons, and to open a way through snow-drifts for their release. The ruin and neglect of these useful buildings and customs, is a proof of the decay of trade and of the indifference of the local governors to the welfare of the people."

This road was followed, almost throughout, by the 10,000 Greeks in their celebrated retreat from Arbela to Trebizond, and was the scene of their almost daily encounters with the Carduces, the ancestors of the present Kurdish tribes. From Bitlis there is communication both by the lake and by land with Van, the capital of the Pashalic and the centre of an important Armenian community.

The town of Bitlis itself is situated on the banks of a tributary of the Tigris; but being only a few hours distant from Lake Van, from which it is easily accessible, while it is separated from the Tigris Valley by deep gorges and rugged passes, it would appear destined to fall under the power which shall in future hold the former rather than the latter basin.

The frontier so rectified would show Russia in occupation of the head waters of both branches of the Euphrates, and of the basin of Lake Van, together with the most considerable towns of Armenia, all connected by an historical highway: and thus directly threatening the two most important strategical positions on the Upper Tigris, viz., Diarbekr and Mosul.

From this general forecast of Russia's future frontier towards the Tigris and Euphrates, let us proceed to the consideration of the passes and routes leading to the plains.

Beginning with Diarbekr, as Russia's most westerly objective point, we find that it is separated from Erzeroum by a part of the Anti-Taurus range, known by the local names of Bingol Dagh, Khosma Dagh, Dushook Dagh, and Mesoor Dagh, which occupy the whole country between the northern and southern branches of the Euphrates for upwards of 150 miles above their junction. And that caravans have been obliged for several centuries to follow the



circuitous routes, either by Mush to the east or by Egin and Kharbut to the west.

With the latter route I propose to begin this notice, as being the most westerly line of communication between Erzeroum and the valley of the lower Euphrates, and I will quote the authority of Mr. Brant, British Consul at Erzeroum, who made the journey to Diarbekr in 1835 ("Journey through Armenia and Asia Minor"—"Journal of Geographical Society," vol. vi, p. 201):—

*Route 1.* "The distance from Erzeroum to Karghan may be about 50 miles in a west-south-west direction. Between the plains of Terjan and Erzingan a mountain range intervenes with many very strong passes easily defensible. It is inhabited by Kurds, and forms part of the Dujik range. The river makes a circuit far into the mountains. Its channel is said to be full of rocks and rapids. It rejoined our route as we entered the plain of Erzingan. The Dujik mountains are peopled solely by Kurds who inhabit villages in winter and cultivate the land. They are represented as rich, pay no sort of contributions to the Sultan, lose no opportunity of levying them on passengers they meet, and are in the constant habit of plundering their neighbours . . . .

"The climate here (Erzingan) is never severe in winter, and it is warmer than that of Erzeroum in summer.

"The harvest was ready (6th July) for the sickle, and the season was rather more backward than usual. On the northern side of the plain the bases of the mountains bounding it are covered with villages, surrounded by very extensive gardens, which furnish, in great abundance, excellent fruit to the circumjacent districts, even as far as Erzeroum, Baibut, and Gumish Khaneh. Grapes and melons are among the fruits produced. The fields bore the most abundant crops I had anywhere witnessed. The wheat was heavy and the straw much longer than in the Erzeroum plain . . . In no part of Asia Minor did I see a plain with more luxuriant vegetation, nor the appearance of more careful cultivation.

"Crossing the plain in a southerly direction, in about an hour and a-half we entered a very narrow defile through which the Kara Su flows. This defile in its whole length to Kemach is very strong and presents innumerable defensible positions. The river was on my left, running at the foot of the Dujik mountains; on my right were mountains all but precipitous. The river is fordable in one or two places, with some difficulty, during the dry season. It took me ten hours to go from Erzingan to Kemach, but from the nature of the road I should not conceive the distance to be above 26 miles.

"I entered Kemach by a bridge of wood thrown over a deep chasm in the mountain through which the river has forced its way . . . .

"On quitting Kemach I recrossed the bridge by which I had entered it and took a course more westerly than the river, crossing mountains which here and there presented strong positions . . . . .

"After crossing to the left bank of the river, I continued along it for about three miles, till I reached a village below which the stream again enters a vast rent in the mountains, the precipices on either side rising to 1,000 or 1,500 feet . . . . . There is said to be a better, though a longer, road by keeping along the right bank of the river, but it could only be better by comparison—good it could not be . . . . .

"After quitting Egin, we continued on the western bank of the river, but instead of following the windings of the stream we crossed several steep mountains and deep valleys. The road is less difficult than that by which I approached Egin . . . .

"The distance from Egin to Arabgir may be about 30 miles in a direction first south and then south-west. There was stated to be a better road from Hassan Ovah, avoiding Egin and keeping at a distance from the river . . . . .

"The road from Arabgir to Kebán Maden lies over an undulating, open, barren, and uncultivated country, affording only a scanty herbage to a few cattle and sheep. Between Arabgir and the Euphrates, a distance of about twenty miles, I passed but one village with a little cultivation around it. Before reaching the river, I fell into the military road, constructed from Samsun by order of Reshid Mohammed Pasha:



it appeared to have been made with too great haste and too little labour to promise durability. I crossed the Euphrates by a ferry; there are three boats, clumsily constructed but adroitly managed. The stream is about 120 yards wide, deep and rapid.

(P. 208). "Descending from the eminence on which the town of Kharput is situated we crossed the plain in an oblique direction, and ascended a very steep mountain, on the face of which the military road has been continued, but the passage is still very difficult, on account of the extreme rapidity of the ascent, which it took us two hours to accomplish . . . .

"We then crossed a beautiful but small plain with two villages in it, and soon engaged in a succession of very difficult mountain passes; here all traces of the military road are lost. In these barren mountains are situated the sources of the Tigris and the copper mine of Aghana . . . .

"From the mine to the town, a distance of about ten miles, in a direction to the eastward of south, the road lies over steep, difficult, and barren mountains."

I have dwelt at such length on the conditions of this road because it is the main trade route from Erzeroum and Erzingan, not only with Diarbekr, but with Aleppo and Syria.

From the survey of the Kara Su valley let us turn to the mountain track, noticed above, separating it from the southern or Murad Su branch.

Upon this district, until then supposed to form an impenetrable barrier and inhabited by savage tribes, Mr. Layard, our present Ambassador at Constantinople, was the first to throw light in the following passage ("Nineveh and its Remains," p. 9) :—

"With him" (Mr. Brant, British Consul at Erzeroum, 8th September, 1848), "I visited the Commander-in-Chief of the Turkish Forces in Anatolia, who had recently returned from a successful expedition against the wild mountain tribes of Central Armenia . . . .

"His last expedition had been the subjugation of the tribes inhabiting the Dudjook mountains, to the south-west of Erzeroum, long in open rebellion against the Sultan. The account which he gave me of the country and its occupants much excited a curiosity which the limited time at my command did not enable me to gratify.

"According to the Pasha, the tribes are idolatrous, worshipping venerable oaks, great trees, huge solitary rocks, and the grand features of nature . . . .

"The direct road between Trebizond and Mesopotamia once passed through their districts, and the remains of spacious and well-built khans are still seen at regular intervals on the remains of the old causeway. But from a remote period the country had been closed against the strongest caravans, and no traveller could venture into the power of tribes notorious for their cruelty and lawlessness.

"The Pasha spoke of re-opening the road, re-building the caravanserais, and restoring trade to its ancient channel."

Nearly 20 years elapsed without anything more being heard in England of this most important district till Mr. Consul Taylor of Diarbekr communicated in 1868 to the Geographical Society the result of his explorations.

*Route 2.* Leaving Erzingan Mr. Taylor made his first march to Philamier at the foot of the snow-capped Deyrism Hills, which seemed to bar all further progress. From this point the road is described in the following abstract ("Proceedings of Royal Geographical Society," vol. xii, p. 203) :—

"From Philamier Mr. Taylor was surprised to find a good road, though hilly in parts, leading through the Koozichan district as far as the Deyrism range, through which, though popular error represented it as inaccessible, a remarkably easy route

exists all the way to Masgerd, never he believed, since the days of the Seleucidæ, traversed by civilized beings, and which the jealousy of the Kurds had hitherto concealed from foreigners—for the obvious reason that the former do not wish it known that so easy a route exists through their formidable mountains.

"It passes through undulating valleys, studded with thriving villages, and the country on either side is beautifully wooded with oak, pine, and poplar, and opens here and there into fine level, well-watered plains. Two considerable affluents of the Meזור Su, that great tributary of the Tigris, rise in these valleys . . . .

"These valleys are inhabited by a numerous population of Kurds . . . . The Kurds appear well off, and the seclusion which they enjoy protects them from the impositions and taxes laid on their less fortunate neighbours."

*Route 3.* Besides this long forgotten and important route, Mr. Taylor explored in 1866 two other tracts through Deyrism. One of these crosses the Kara Su Euphrates by a bridge at Erzingan, ascends the Mesoor Dagh by the course of the Boghaz river to the Sakkal Tuttan, or "beard plucking" (so called from the robberies committed there), then crosses the Mesoor Su and reaches Kozat in five marches, where there is a permanent Turkish barracks, occupied by 600 men and 6 guns.

*Route 4.* The other route crosses the Kara Su by a bridge at Komach, 20 miles below Erzingan, passes the Mesoor Dagh by the Ziarat pass, 8,000 feet high, which was found so difficult that the mules had to be unloaded and the baggage carried by hand for some distance. This route joins the last-mentioned at Kozat in four marches.

The tenor of these two itineraries shows that these last-named roads can only be regarded as subsidiary lines of communication.

But it will be seen from the survey of these four passes, connecting the valleys of the northern and southern Euphrates, that the northern entrances are all commanded by the town of Erzingan, which thus becomes a position of vital importance to Turkey against an enemy advancing southwards from Erzeroum.

From Mr. Taylor we gain the first authentic information regarding the strange religious tenets of the pagan Yezede or Kissilbash tribes of the Dujook Dagh, alluded to by Mr. Layard, and their hatred to the orthodox Mussulman (See also Mr. Brant, "Journal of Geographical Society," vol. x, p. 354).

His paper further establishes the fact, that not only is the Murad Su Euphrates navigable for rafts from its junction with the Meזור Su above Peyrtek to the silver mines of Kebban Maaden, but that the latter tributary is also navigable for some distance into the hills, as corroborated below by Von Moltke.

*Route 5, Mr. Brant.*—Next in order to the eastward comes Mr. Brant's return journey (p. 366), in company with Dr. Dickson, in 1838, from Kharput to Mush, following the left bank of the Murad Chai to Palu, where he passed to the northern bank by a rickety bridge, fixed on the old stone piers. There is nothing of special interest in this road to the point where it joins that taken by Mr. Taylor two marches further east (Route 8), but the fact that Mr. Brant was encumbered by a large part of his attendants being so prostrated from fever that they had to begin the journey in arabas, proves that the road must have been an exceptionally good one.

But the most important fact is established that Mr. Brant travelled for five miles out of Palu, on the direct road to Erzeroum, though his notice of it is unfortunately confined to the following lines (p. 368):—

“The direct road to Erzeroum is closed by snow during three months; the distance is eight caravan days and 42 post hours.”

This is, as far as I am aware, the only notice by a recent traveller of one of the most important routes in Armenia, for an account of which we must refer 170 years back to the narrative of Paul Lucas, who travelled on behalf of the King of France in southern Armenia, shortly before Tournefort's visit to the districts of Erzeroum and Kars. In the short interval which elapsed between the peace of Ryswick and the war of the Spanish succession, the Grand Monarque appears as the patron of these pioneer explorers.

How complete was the ignorance till then prevailing of the outlines of Armenian geography is proved by the fact that when Paul Lucas followed a tributary of the Murad Su Euphrates from Palu to its source, and then crossed the watershed to Melican on a tributary of the northern, or Kara Su, branch, he in each case believed himself to be on the main stream, and did not discover his error even when compiling his narrative, as shown by the following extract (“*Voyage au Levant*,” Paul Lucas, à la Haye, 1700, vol. i, p. 196):—

*Route 6, September 11th.* “The mountains over which we passed were strewn with large round stones, which caused our horses to stumble every moment. After having descended a high mountain, we arrived near a village situated in a fine plain, where we encamped.

*12th September.* “After twelve hours of fatiguing march, always in high mountains, covered with shrubs and oaks, which bore large acorns, we encamped at the foot of one of these mountains near the Euphrates.

*13th September.* “A similar road over mountains which extend along the river. These heights are passed by a little path cut in the rock, over which, on overhanging precipices, eagles built their nests.

*14th September.* “After six hours' marching along the Euphrates, which we forded four times, owing to its windings, we passed by precipices so terrible, that they must be seen to be imagined. Conceive a wall of rock, higher than the towers of Notre Dame at Paris, along the banks of the Euphrates over which there is only a little path a foot in width, and in many places broken away, and so slippery that if one made the least false step he would fall into the precipice. It was a wonder that our horses and mules escaped. We passed the Euphrates on a bridge of only two arches, and, after having ascended a highish mountain, we encamped on its summit, surrounded still by very high mountains.

*15th September.* “We did nothing but descend, during seven hours, after which the Euphrates is again forded, the water being low at this season. The river was almost nothing at this spot, and sometimes it only appeared a rivulet. We encamped about a quarter of a league after having passed the Euphrates near a village named Melican, where also another caravan was halted, which was going to the slave market at Erzeroum.”

From Melican he found the journey a “promenade on good roads among small hills to Erzeroum.”

Paul Lucas describes the town of Palu as—

“Situated on a hill very steep on all sides, with narrow streets running along the edge of frightful precipices. There is also on the top of the rock sufficient soil to support a small garrison. The Euphrates passes along the foot of the town on one side, and its situation has rendered it impregnable to the very large armies which the Grand Seigneur has sent against it, and which have only been paralysed there.”



The eminent German geographer, Karl Ritter, gives ("Comparative Geography" by Karl Ritter, vol. vii. p. 717), on Niebuhr's authority, which has also been accepted by Dr. Kiepert, a direct route of five marches from Palu to Diarbekr; and the fact that it is the point at which the two last-mentioned roads meet, viz., those from Erzingan and Erzeroum, and that it commands the valley of the Euphrates, constitutes Palu a most important strategical position.

Let us now cross to the southern bank of the Murad Chai, and follow the route from Palu to Hazru, which was traversed by Captain (now Field Marshal Count) Von Moltke in company with Hafiz Pasha in 1838. His narrative ("Zustände und Begebenheiten in der Türkei," Von Moltke, Berlin, 1875 (Condition of and Occurrences in Turkey), p. 287), is unfortunately very meagre regarding the nature of the road.

Having arrived the previous day from Mayafarkin to the eastward, he writes:—

"On the following day we rode through the mountain to Ilydscha, and at four in the evening after a forced march, we arrived at Sivan Maaden. Only the best horses kept even near the excellent Arab mare of the Pasha; full the half of his train were left behind, and the worst part of them sank under the effort. Scarcely could a richer iron mine be found, or one easier to work than this. You need not go under the surface of the earth, for hills and valleys are covered far and wide with small and large blocks of stone of a black colour. You need only take these stones in the hand to be quite convinced by the mere weight of them how full of metal they are.

"While we rode up one of the affluents of the Tigris we reached the high watershed between this stream and the Euphrates or Murad; but it is very surprising how near the sources of the former and the banks of the latter lie, at a place moreover where it has grown into a great stream. The interval scarcely amounts to more than 1,000 or 1,500 paces."

Regarding the descent to the banks of the Euphrates from the watershed, Von Moltke is unfortunately silent, but the omission is partly supplied by Von Mülbach, as cited by Karl Ritter ("Comparative Geography," vol. vii, p. 710):—

"From Palu Von Mülbach, after a march of six hours, on the road to Sivan Maaden, pitched his camp, on 18th February, at the Kurdish village of Akrakli lying close to the southern bank of the Euphrates. The path from thence ran partly along the slope of the banks of the Murad, and was dangerous to pass in consequence of the still frozen places, and the cascades which spouted from the precipices on the southern faces of the mountains.

"On 19th February he could only climb on foot to the watershed between the Murad and the Tigris, to the village of Sheik Ismael-an, in order from there to reach Sivan Maaden, for which eight hours were required, on account of the still deep snow, and the absence of any track over the mountain tops, although the distance is only half as much."

Karl Ritter attaches the highest importance to the iron mines of Sivan Maaden as furnishing abundant supplies of iron for the future defence of the fortress of Diarbekr (vol. vii, p. 711); and Von Moltke shows the possibility of, but the dangers attending the navigation of the Euphrates in his narrative of his descent from Palu to Samosata on a raft, a distance of about 400 miles, down a succession of dangerous rapids, which may perhaps be regarded as not the least adventurous exploit of an eventful career (p. 289).



*Route 8.* Passing on to the east, we find from Mr. Taylor's paper, communicated to the Geographical Society (p. 448), in 1865, that Diarbekr has communication with Mush by a road which, descending the Murad Su Euphrates from the latter town, passes to the right or northern bank, then following the fruitful Boglan Valley, and over the Tchabakchoor plain, crosses again at Dyg to the southern bank. Mr. Taylor is unfortunately silent as to the character of this road from the channel of the Murad Su to the head-waters of the Dibeneh Su tributary of the Tigris; but from the fact that he dwells on no difficulties such as he encountered in Routes 3 and 4, while matters of archæological or geological interest are fully detailed, we may infer that the obstacles encountered were less serious.

From Heyni to the town of Dibeneh he describes the road as "running through the beautiful valley of Pelishka, close to the low range of hills that bound the valley of Nerib on this side. It is inhabited by a set of Kurds (always in rebellion) living in their secluded and inaccessible valley, which still contains several ruins of a very ancient date."

From the pretty little town of Heyni, Mr. Taylor went, by a well-populated country and frequent villages with extensive ancient ruins, to the town of Khuzru, at which also converge the track followed by Von Moltke from the head-waters of the Dibeneh Su, and also that taken by Lord Pollington over the Chulp Dagb Pass, and through Nerjki.

Kazru seems therefore to be a place of considerable strategical importance, as the point of junction of three passes leading north, and also that to the east by Mayafarkin and Arzen to Sart and Bitlis; and also from its situation in the great undulating plain extending from the Tigris to the Garzan Dagb, with direct communication with Diarbekr and Maaden.

We have already noticed in Route No. 5, Mr. Brant's return journey from Karpuz to Mush, in 1838. On his journey to Karpuz, which we have now to consider, he chose the more rugged and less frequented track which crosses the mountains directly to the south from Mush, and joins at Heyni Mr. Taylor's Route No. 8, last described.

*Route 9 (July 3rd, 1838, "Journal of Geographical Society," vol. x, p. 354).* "From Kizil Arghai we ascended the mountains. After reaching the summit of the first range, called Koshm Tagh, at about 6,800 feet we saw two others; the highest, named Antogh Tagh, had a good deal of snow on it, but it does not remain all the summer; this mountain appeared the centre of the group, the ranges on each side being lower . . . We descended into a deep ravine, and after a few ascents and descents, not very long nor steep, reached a valley called Shin . . .

*(July 4th).* "Immediately on mounting, we commenced ascending the Darkush Tagh. It took us one and a half hour to reach the highest part of the range, which we crossed at 6,490 feet above the sea, and immediately commenced the descent by the most difficult path I ever went over; sometimes it led us round precipitous hollows in the hills; sometimes it came down, in a zig-zag, the face of a nearly perpendicular rock; our horses, though led, often slipped off the uneven narrow path, and risked being precipitated into the abyss, perhaps, 1,200 feet in depth, and it was by great caution alone that a person, even on foot, could keep his path . . . After a difficult and fatiguing walk of two hours (for riding was seldom possible) we found ourselves opposite to the high ridge we had crossed, and scarcely a mile distant from it. We waited two hours for our

baggage to come up, fearing the muleteers might require assistance. We then proceeded winding along the mountain sides by paths very little better than those just described . . . At seven o'clock we reached the village of Nerjki. The distance we had come was called eight hours by the Kurds. We had been ten hours riding and walking, besides many long stoppages for our baggage . . . I never met in my travels so difficult and dangerous a pass; the passage of troops could be easily arrested by a small force, and it would be quite impossible to drag artillery over it. Yet I was told the Kharzan mountains are still more impracticable, and that no loaded animal except a mule can traverse them at all."

From Nerjki, Mr. Brant took the road due west to Aghana Marden, passing through Iljeh, Khini, and Zibeneh. This road seems to be of secondary strategical importance. The local Begs had all been recently brought into subjection to the Porte by Reshid Mohammed Pasha, and in Mr. Brant's "opinion, the people now enjoy the most perfect security, which they never could ensure for an instant under the former system."

*Route 10.* Lord Pollington ("Viscount Pollington from Erzeroum to Aleppo," *Journal of Geographical Society*, vol. x), had preceded Mr. Brant by only three weeks, crossing the Darkoosh Tagh on 12th June. He was hospitably entertained by the Yezedi tribe at the foot of the pass, and then crossed by a road which he describes as "excrably bad throughout."

Passing on further eastward we come to the main road connecting Bitlis, near the south-western corner of Lake Van, with the Tigris Valley, which has been already alluded to as the old historic trade route from Mosul (Nineveh) to Erzeroum and the Black Sea. It may perhaps be more correctly described as a group of passes, for below Bitlis three roads diverge, two of which cross the Ali Tagh Mountain near together at the Dezej Tasul Pass, which Mr. Ainsworth gives as 5,120 feet. The third, more to the west, which passes through Warchan was followed by Colonel Shiel ("*Geographical Society Journal*," p. 73), in 1836. He describes it as follows:—

*Route 11.* "We proceeded (from Bitlis) at first down the left bank and then passed over to the other side by one of the numerous neat stone bridges by which it is crossed. The road lay through the narrow defile which is formed by the stream, and was the worst, if not the only really bad one we encountered. The path was high above the bank, sometimes so narrow as scarcely to give room for the horses' hoofs, and at times so impeded by large stones that our progress did not exceed one mile an hour. At about the fifth mile, the road was crossed by a high ridge of rock which reached the stream. Instead of carrying the road over it, an opening was cut through the solid rock of 15 ft. in width and height, and 20 in length. (P. 74) We met a caravan of mules proceeding from Bitlis to Shirwan, said to be eight hours south-east, with salt . . . At the 16th mile we crossed over a stone bridge to the left bank of the stream, which was rapid and deep, though not more than twelve yards in width. At about the twentieth mile we ascended a high mountain in a southerly direction, and left the river, which flowed to the west. The ascent was most fatiguing to our exhausted cattle. We then descended at 8 P.M. to the district of Warchan, completely worn out . . . Although we had been ten hours on horseback, I do not think we had travelled a greater distance than twenty-six miles; yet so great was the fatigue that I doubt whether the horses ever recovered from the effect of it."

*Route 12.* Mr. Ainsworth ("*Ainsworth's Travels in Asia Minor*," p. 365), who took the more easterly route by Kufra, though acknowledging difficulties, seems to have regarded them as trifling

after what he had encountered in the Nestorian districts of the Zab-Ala.

"At Kufra (going northwards) commences the most difficult pass which the mountains present on this line of road, and which Kinneir describes as the worst he met with. What would he have said to the passes in the Tiyari country? It is carried along the side of a hill composed of sandstones, with limestone forming cliffs above."

The distance from Bitlis to Til at the junction of the two branches of the Tigris is estimated at from 64 to 80 miles.

Mr. Layard ("Nineveh and Babylon," p. 37) pronounces the following opinion on the merits of the several routes from Bitlis:—

"There are three roads from Bitlis to Jezireh, two over the mountains near Sert, generally frequented by caravans, but very difficult and precipitous; a third more circuitous and winding through the valleys of the eastern branch of the Tigris. I chose the last, as it enabled me to visit the Yezedi villages of the district.

*Route 13.* "We left Bitlis on 20th September. Soon issuing from the gardens of the town, we found ourselves amidst a forest of oaks of various descriptions. It was one of those deep, narrow and rocky valleys abounding in Kurdistan, the foaming torrents dashing through it, to be crossed and recrossed, to the great discomfort of the laden mules, almost at every hundred yards, and, from want of bridges,<sup>1</sup> generally impassable during the spring and after rains . . .

"Several bridges and spacious khans, whose ruins still attest the ancient commerce and intercourse carried on through these mountains, are attributed, like all other public works in this country, to Shah Murad, during his memorable expedition against Bagdad, A.D. 1638. About five miles from Bitlis the road is carried by a tunnel about 20 feet in length through a mass of calcareous rock, projecting like a huge rib from the mountain's side.

"There are many such in the mountains,<sup>2</sup> and the remains of a causeway, evidently of great antiquity, in many places cut out of the solid rock, are traceable in the valley.

(P. 63.) "The direct and most practicable road (for the 10,000 Greeks) would now have been along the river banks to Bitlis. That by Sert is over very precipitous mountains and is only now taken by caravans, because it is more secure than the others and leads through a town where there is some trade."

Mr. Layard reached Redwan, where these three routes join, in five marches from Bitlis. From Redwan and Til, roads branch off in all directions to Diarbekr in the west and to Mosul in the south-east.

The strategical importance of Diabekr to an army operating from Erzeroum and Van towards Aleppo and Mosul, can scarcely be over-estimated, and Colonel Chesney's description ("Chesney's Euphrates and Tigris," p. 15) of its former commercial importance is of interest as showing its future capabilities under fair conditions.

"Diarbekr in its prosperity contained 40,000 inhabitants, with numerous cotton looms constantly at work, and it enjoyed an active trade in gall nuts, not only with Kurdistan but also with India on one side through Bagdad, and with Europe through Aleppo on the other."

Colonel Chesney's testimony is amply confirmed by that of Mr. Brant ("Journal of Geographical Society," vol. vi, p. 209):—

"The town (Diarbekr) in its prosperity contained 40,000 families, or houses, and numberless looms in constant work; it enjoyed an active trade with Bagdad in Indian, and with Aleppo in European produce, and was one of the most flourishing

<sup>1</sup> Bridges found in good order by Colonel Shiel, see above, in 1836.

<sup>2</sup> See Colonel Shiel's Memoir above.



and wealthy cities in Asia. The plain was cultivated in every part and covered with villages, and within three miles of the gates there were several villages, each containing from 400 to 500 houses, and more than one Christian Church. At present the number of houses or families in the city is reduced to about 8,000; there exist but a few hundred looms, half employed; the trade with Bagdad is annihilated, and that with Aleppo is reduced to insignificance . . . All this desolation and depopulation was produced by the Kurds, and that too in the memory of my informant, within 25 years.

"The situation of Diarbekr is admirably calculated for that of a great commercial city, and, nothing appears necessary to revive its ancient importance but a removal of the causes which have produced its decline, namely, insecurity and the interruption of its communication with Bagdad."

Passing still further east, we find that the mountain range separating Lake Van from the valley of the Tigris, was, till visited by Mr. Taylor in 1862, one of the least known parts of the great chain.

*Route 14.* Mr. Taylor, in ascending the Bhotan Su Tigris from Sert, reached Kosheyer, the capital of the Möx or Mukus district, which Mr. Layard gives below as three marches, in seventeen hours ("Journal of Geographical Society," vol. xxxv, p. 47) "through splendid, wild mountain scenery," passing two large Christian villages,

"Situated on either side of a deep ravine absolutely choked with enormous walnut-trees, and luxuriant fruit gardens and cultivation . . . Each bend of the river reveals new beauties, and the traveller while contemplating these charming and peaceful-looking spots, can hardly reconcile their existence with the lawless character of the savage country and of the people who tenant them. A closer visit, however, dispels much of this delightful illusion and reveals a state of poverty, wretchedness, anarchy, and ruthless despotism hardly credible to any but those who have taken the trouble to step out of their path to judge of things with their own eyes. Koshkeyr is several hundred feet above the river, and the slope to it is covered with numerous carefully cultivated gardens, yielding the finest peaches, grapes, figs, pears, and sultana raisins I ever saw or tasted.

"The town itself contained, four years ago, 260 houses, at present there are only 120, and of this small number 50 had been gutted and burned a few days before my arrival, in a conflict between two local hostile parties, whose chiefs were litigating before the Turkish governor at Sert. The Kurds here belong to a tribe originally Yezid, descendants as they say of the real Sheik Adi, the saint of those extraordinary people."

At the risk of wearying the reader I must give one more extract from Mr. Taylor's paper (*idem*, p. 50) to show of what heterogeneous and unsettled elements the population of these upland valleys is composed.

"All the working and industrious portion of the population of the mountain districts here, and generally throughout Kurdistan, are Armenian and Nestorian Christians, living in a state of serfage, they being the property of the local Kurdish chiefs, who call them their Zeer Kurlees, a term signifying bought with the yellow, meaning gold, as in fact they are bought in the same manner as sheep and cattle."

This account is confirmed in a remarkable manner by Mr. Layard ("Nineveh and its Remains," p. 419) in describing this, the only point at which their routes joined.

"Shattak is a small town rather than a village. It is chiefly inhabited by Armenians, an industrious and hardy race, cultivating the sides of the mountains on which are built their villages, and weaving in considerable quantities, the gay-coloured woollen stuffs so much esteemed by the Kurds. In nearly every house was a loom, and the rattle of the shuttle came from nearly every door. The large and flourishing Armenian communities inhabiting the valleys between lake Van and Jezireh appear to be unknown to modern geographers, and are unnoticed in our best maps."



"The difficulties and dangers of the road have hitherto deterred travellers from entering their mountains. The existence of this people in the heart of Kurdistan might, if taken advantage of by the Porte, be the means of establishing an important trade, and quieting and civilising a country but recently brought under its rule."

Unfortunately for the cause of geography the details of Mr. Taylor's journey from the Mokus district southward across the Djudi Dag Range to Jezireh have not been communicated to the public.

*Route 15.* Mr. Layard, on his return journey from Van to Mosul crossed the Achovar Pass into the valley of the Bhotan Su and turned thence directly eastwards into the Hakhiari mountains. The pass itself cannot be better described than in his own words (Layard's "Nineveh and Babylon," abridged edition, p. 219):—

"We had now (12th August) left the lake (Van) and our track led up a deep ravine, which gradually became more narrow as we came nigh to the high mountains that separated it from the unexplored district of Mukus and Bhotan . . . On both sides of the ravine were villages and ruined castles, numerous streams from the mountains irrigated plots of cultivated ground. Ere long we entered a rocky barren tract, patched here and there by fragrant Alpine flowers. After climbing up a steep declivity of loose stones, like the moraine of a Swiss glacier, and dragging our horses with much difficulty after us, we found ourselves amidst eternal snow, over which we toiled for nearly two hours until we reached the crest of the mountains (given by Kiepert as 13,000 feet) and looked down on the valley of Mukus. This is considered one of the highest passes in Kurdistan, and one of the most difficult for beasts of burden . . . The descent was almost more rapid and precipitous than the ascent, and we could scarcely prevent our weary horses from rolling down into the ravine with the loose stones we put in motion at every step." (An eight hours' march).

("Nineveh and its Remains," p. 418). (From Mukus). "The path following the course of the river leads to Sert, Jezireh, and the Assyrian plains." (From Mokus to Jezireh there are five caravan days' journey, and to Sert three, by difficult mountain roads)."

("Nineveh and Babylon," p. 221.) "The district of Mukus, anciently Mozkh, and one of the provinces of the Armenian kingdom, had only lately been brought under the authority of the Sultan. Like the rest of this part of Kurdistan, it had long maintained its independence under hereditary chiefs, the last of whom, Abdal Bey, after several times defeating the Turkish troops sent against him, was at length captured as he was flying into Persia."

Following up the valley of the Shattak Su tributary, which may be perhaps hereafter recognized as the true Tigris, the route led over two formidable passes, one of which Kiepert gives as 12,000 feet, and over upland valleys of great richness, alternating with ravines deep in snow, where it was wearisome and dangerous to ride, and through which the horses had to be dragged over the rocks; till, crossing the watershed at the Kurdish summer encampment at Billi, his party descended into Zabala Valley at Julmerg.

*Route 16.* Directly to the north of the above route, and running almost parallel with it, is another mountain track by which Mr. Layard entered the Van district in 1850 from the head-waters of the Zab-Ala, and which he thus describes ("Nineveh and Babylon," p. 199):—

"A dell near our path was pointed out to me as the spot where the unfortunate traveller Schultz was murdered by Mir Ullah Bey, the Kurdish chief of Hakhiari. Turning, up a narrow pass (from the valley of the Zab-Ala) towards the high

mountains, we came suddenly in sight of the castle of Bash-Kaleh (7,818 feet) one of the ancient strongholds of Kurdistan . . .

"Bash-Kaleh was formerly the residence of Mir Ullah Bey. He joined Beder Khan Bey in the great massacre of the Nestorians (1846), and for many years sorely vexed those Christians who were within his rule . . .

"On resuming our journey after a day's rest, we took the direct though difficult track to Van, only open in the middle of summer.

"Following a small stream, we entered a ravine leading into the very heart of the mountains. Three hours' ride, always rapidly ascending along the banks of a rivulet, brought us to a large encampment (of Jews carried away captive in the second century A.D.) . . .

"We had now reached the higher regions of Kurdistan (9,076 feet). Next morning we soon left the narrow flowery vale and the brawling stream, and entered an undulating upland covered with deep snow, considerably more than 10,000 feet above the level of the sea. On all sides of us were towering peaks, and to the west a perfect sea of mountains, including the lofty ranges of Hakkari and Bhotan. Descending rapidly (from the watershed into the basin of Lake Van) and passing one or two miserable, half deserted Kurdish hamlets, we entered a long narrow ravine, shut in by perpendicular cliffs of sandstone and conglomerate. This outlet of the mountain streams opens into the valley of Mahmoudiyah, in the centre of which rises an isolated rock, crowned with the picturesque castle of Kosh-ab."

Of the two last described routes from the Van district the former presents a succession of such formidable passes and intricate ravines, that it may be almost left out of our consideration as an approach to the Zab-Ala valley; but until further particulars are known of Mr. Taylor's route from the Shattak Su to Jezireh, and in consideration of the large Kurdish and Armenian population, virtually independent of the Porte, in the valleys of the Bhotan Su Tigris, it would be premature to exclude the Achorav pass from the lines of practicable summer communication between Van and the Tigris Valley.

The other route just described through Bash-Kaleh and Kosh-ab, though passing over an upland of 10,000 feet, is the direct summer caravan route between the city of Van and the lower Tigris.

Having brought the reader by these two routes from the Van district into the Zab-Ala Valley, it remains to consider the tracks which lead through the basin of this important tributary to Mosul on the Tigris.

*Route 17.* Mr. Ainsworth appears to be the only traveller who has given us any description of the course of the river from near its source to Amadiyah. In 1843, in company with Mr. Mitford and Mr. Rassam, he ascended the right bank of the Zab-Ala through that most difficult region, in comparison with which he might well look on the pass of the Ali-Tagh, near Bitlis, as child's play. Of its character the following description ("Travels in Asia Minor," p. 216) of the approach to the Tiyyari county may be taken as an example:—

*June 15th.* "Passing the Tura Duri we gained the crest of the Duralina Hills, the view from the summit of which was truly Alpine. We stood at an elevation of 5,811 feet above the level of the sea, and the valley immediately below us was nearly filled up with snow, upon which in one spot lay a whole grove of trees that had been carried down by an avalanche; but below the valley descended rapidly, till, with one or two villages dispersed in its rugged acclivities, it terminated in a precipice over the deep ravine of the Zab. Beyond these, other vales, each with their tributaries, of many miles of length and width, reached upwards towards the snow-clad summits of the Tura Shina. . . .

"The descent from the Duralina Mountains was steep and tedious. Accompanied by our Greek servant, I started on foot and gained the last valley of vassal Kurds

towards the Tiyari country, and at the foot of a range of hills called here Karasi Tiyari. It appeared from the crest of the mountains to be just beneath us, but it took us a long hour and a half to reach it, half walking, half running. Here we had to wait upwards of an hour before the party had assembled. Mr. Rassam and Davud had attempted to ride down, and had both had falls, by which the interpreter had so hurt his back that we were obliged to have a little longer respite . . . The path, or mule-way, for it was never anything more, took us round the southern slope of the Karasi Tiyari, where its huge shoulder presses down upon the valley of the Zab. This rapid river rolled along amid impracticable precipices, nearly 1,000 feet below us. . . .

(P. 228.) "At Murah we commenced the ascent of the mountain. The heat of the sun rendered the toil most severe. In one hour's time we reached the foot of the cliffs, the mules working up behind; we then turned along the precipice, near its foot. The road was so bad that we had twice to load and unload the mules; at length we reached a gap in the rocks, which led us to a vast growth of fennel, which announced proximity to the snow line. . . . On two occasions they had to be unloaded. . . .

(P. 235.) "We got down the valley of the Itha by means of a glacier, about a mile in length by 300 yards in width. It sloped more gently than the preceding ones; and, although perforated by a mountain torrent, it bore mules and men in safety. By commencing too precipitately, I got into a rate of descent which soon attained a celerity that threatened disastrous results. I endeavoured in vain to bring myself up by thrusting my stick into the snow between my legs, for I was sliding down, from the momentarily increasing velocity I was gaining, with nothing but destruction before me, when I made a last and desperate effort to fix my stick deep enough in the snow to arrest my body, and this time, to my infinite satisfaction, succeeded. When I regained composure, I found myself half a mile from my comrades, near the bottom of the glacier, covered with perspiration and trembling all over."

From this point northwards Mr. Ainsworth found a marked change in the features and scenery of the hills.

"The country towards the head-waters of the Zab (p. 292), beyond this, quite changed its character. There were still a few mountain points with a bold outlying rock, called the Rock of Fire; but the outline of the chains is now tame and rounded, the ranges being neither serrated nor boldly defined, and rising so little above the level of the uplands as to have the appearance rather of hills than mountains."

This may be accepted as the general character of the country which lies along the western side of the watershed separating the Zab-Ala from the basin of Lake Urumiyah, and traversed by Mr. Layard on his journey already mentioned to Lake Van, in company with Mr. Walpole in 1850. (Route 16.) On these upland downs extending from the residence of the Chaldean Bishop at Mar Hananisho on the Persian frontier to the head of the Zab-Ala, herds of horses and cattle belonging to the summer encampments of Kurds were met with; and the natural difficulties had in a great measure disappeared, which he and his party had encountered in the lower valley of the Zab-Ala, both in the earlier part of this expedition to Van, and also in that of 1846, to the Chaldean Christians of the Tiyari district.

His track in 1850 lead from Mosul straight in the direction of the town of Urumiah to Mar Hananisho, while that of 1846 kept much nearer the main stream of the Zab-Ala, though on the opposite side to that taken by Mr. Ainsworth a few years before, till their two routes joined at Julamerick.

Mr. Saudreski ("Journey to Mosul and through Kurdistan to Urumiah." Stuttgart, 1857, by Saudreski), travelling on behalf of



the Church Missionary Society in 1850, followed the same route as Mr. Layard took in that year (though it does not appear that they travelled in company) until he diverged at the village of Neri, taking the track leading direct to the town of Urumiah.

The general character of this part of Kurdistan is described in the following extract:—

“These Kurdistan Highlands present innumerable valleys, gorges, ravines, and mountain passes, very difficult to cross, and capable of being easily defended. They are wedged in between the two rival powers, Turkey and Persia, with Russia leaning heavily on both; and are sparsely peopled by wild Kurdish tribes of Aryan stock, mostly at feud with each other; but ever ready to form temporary alliances for or against either of the foreign states. They have been kept in subjection partly by the exile or imprisonment of their chiefs; but their hearts are filled with hatred of the Turk, for whom their highlands must ever remain a dangerous volcano full of combustible materials. The tribes are only awaiting a favourable opportunity to throw off the Turkish yoke, such as an invasion of Turkey by Persia or Russia.”

Elsewhere, however, he describes the tribes as equally hostile to Russia, and they generally felt greatly relieved when assured by the traveller that he was not a Muscovite.

In endeavouring, however, to form a true estimate of these routes, it is only fair to bear in mind that the Kurdish chiefs, who often acted as Mr. Layard's guides during his second journey, seem almost invariably to have accompanied him mounted.

We have, moreover, the significant admission of Mr. Walpole in his description of this journey (“The Ansayrii and further East,” by Walpole) that, though racked with fever and so weak as to be incapable of walking, and able only with difficulty and great pain to sit his horse, he was still able to complete his journey to Van with Mr. Layard and his party.

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## PART II.

No. 17. Ainsworth.

„ 18. Saudreski.

„ 19. Ainsworth.

„ 20. Von Thielman.

No. 21. Ker Porter.

„ 22. Mignan.

„ 23. Mr. Rich.

„ 24. Do.

THE first part of this paper treats of the passes leading through Turkish territory; but any consideration of routes that might be taken by the Russians to the Tigris Valley must be incomplete which omits to take into account the passes leading from Persia into Turkish Kurdistan by the basin of Lake Urumiyah, and through Mount Zagros to Sulimaniah; since the Persian province of Azerbijan, with its capital, Tabreez, lies completely at the mercy of Russia whenever it may suit the latter's convenience either to annex it permanently, or to occupy it temporarily for the purpose of making it a base of operations against Mosul or Baghdad.

The testimony of Bellew, Mounsey, Arnold, and other recent travellers, proves that Persia has been reduced by the late famine and by systematic misgovernment to a state of abject misery; and the



ultimate, or perhaps early, absorption of this province need be regarded as no flight of imagination when we remember that Tabreez was occupied by Marshal Paskiewitch in 1827, and that in his winter campaign he advanced in three columns to the Kaflan Ku range, thus overrunning the whole province. ("Chesney's Russian Campaigns of 1828 and 1829.")

A full appreciation of the critical position of Russia's weaker neighbours may perhaps be most easily obtained by studying Stanford's map of the acquisitions of Russia, showing her conquests from neighbouring states, beginning with that from Sweden of the ground on which St. Petersburg stands in 1721, to her latest acquisition of Kokand, or Ferghana, in 1876.

Let us therefore, for the sake of argument, suppose that to be accomplished which may at any moment be resolved on, and mark the Russian frontier as passing from the head-waters of the Zab-Ala along the present Turco-Persian boundary by the western watershed of Lake Urumiyah, as far as Bistan, and then sweeping round to the north of Senneh towards the Port of Rescht on the Caspian, thus embracing the basin of the Kizil Uzan river together with the towns of Bidjar and Sultaniyah.

This acquisition of territory by Russia would put her in possession of the entrance of all the passes leading from the basin of Lake Urumiyah to the Turco-Kurdish towns of Rewanduz and Sulimaniah; and it would threaten the main trade and pilgrim routes converging on Baghdad through Senneh, Kermanshah, and Zorab.

We need not here contemplate the actual occupation by Russia of Teheran; but the immediate consequence of the loss of Azerbaijan by Persia in her next war with Russia would be the removal of the capital to its ancient site at Ispahan, and her virtual withdrawal from the basin of the Caspian to the great plateau of Central Persia.

Assuming, then, Russia to be in occupation of the eastern slopes of the Kurdistan range, as far as Mount Zagros in the south, let us begin with the consideration of the passes leading into the Chaldean, or Nestorian, districts from the east, as we have already treated of those from the north.

*Route 17.* The most northerly of these, leading from the sources of the Zab-Ala to Dilman at the north-western corner of Lake Urumiah was traversed by Mr. Ainsworth, on 25th June, 1843, and was estimated at about 7,000 feet in elevation. The general character of this upland has been already given on p. 17, and seems to resemble the description by Mr. Layard of that crossed by him a little further south, viz., "low hills rising from fine pasturing valleys with occasional ravines in limestone." The descent into the plain below, smiling with gardens and villages, occupied three long hours to the Chaldean village of Khosran.

The western shores of Lake Urumiyah are not unlikely hereafter to form a base for future operations to the south-west, and are thus described by Mr. Ainsworth ("Travels in Asia Minor," p. 302):—

"The district of Urumiah presents an extraordinary scene to a person accustomed to the treeless monotony of the plains of Mesopotamia. A more fertile district can

scarcely be imagined—one vast extent of groves, orchards, vineyards, gardens, rice-grounds, and villages ; sometimes with a village common. It much resembles the best parts of Lombardy, between Milan and Lago Maggiore. All the latter part of our journey was carried for many hours over the same plain of exuberant fertility, clothed with luxuriant verdure ; fruitful fields, gardens, and vineyards, irrigated by streams of pure water from the adjacent mountains. The landscape is one of the most lovely in the East ; and the effect is not a little heightened by the contrast of such surprising fertility with the stern aspect of the surrounding heights, on which not a solitary tree is to be seen ; while in the plain, the willows, poplars, and sycamores by the water courses ; the peach, apricot, pear, plum, cherry, quince, apple, and vine in the orchards, impart to large sections the appearance of a rich variegated forest."

Following to the south we find the pass leading over the Persian frontier direct to Urumiyah, from the village of Neri, where we have seen above that Mr. Saudreski left Mr. Layard's route from Mosul. The following is a summary of his narrative ("Journey to Mosul and through Kurdistan to Urumiyah," Saudreski) :—

*Route 18.* Passing the spurs of the Shiah Resh (Black Mountain) he reached the true watershed of this region at a point above the village of Neri. This village is perched on a well-wooded height, growing fine walnut-trees, poplars, &c., and commanding a prospect of the snowfields on the eastern slopes of the Jebel Sati. Beyond Neri a steep and very zigzag path, scarcely more than two feet wide, leads down through a mountain pass and countless windings to a wild and very deep valley. Four hours were consumed in traversing the pass, which brought him to the Nestorian village of Holaneh. Beyond this place is the pass leading southwards to Persia, but trending east by north the route now lay across a bleak ridge destitute of vegetation, 6,000 feet above the level of the sea. The hills themselves about Holaneh attain an altitude of at least 8,000 or 9,000 feet, and are covered with snow even on their southern slopes. Here another pass, an hour long, leads to a wide, verdant valley, encircled by hills on all sides, except towards the north, where it is more open.

The road crossing it, still to the north-east, passes several streams fed by the melting snows, and all falling into a little river winding through the centre of the valley. These streams belong to the water system of Lake Urumiyah and flow through the marshy, but on the whole well-cultivated, plain of Mergovan. Another gloomy pass is now traversed, enclosed by bare, craggy hills, and after countless windings gradually widening towards the north-east, where the hills begin to fall off, and the country becomes more inhabited and better cultivated, the pass leads directly into the plain of Lake Urumiyah, of which it affords a fine prospect, with its gardens, groves, and the glassy surface of its brackish waters, and the hills rising in the distant background beyond it.

I have deemed this route worthy of close attention, in spite of the natural obstacles which it presents, because it offers the most direct communication between Urumiyah and Mosul, while avoiding the still more difficult districts of Hakhiari and Tiari to the north, mentioned before as visited by Layard and Ainsworth, and that of Rewanduz to the south.

*Route 19.* Mr. Ainsworth ("Ainsworth's Travels in Asia Minor," p. 309), returned to Mosul by the pass of Keli-Shin, which leads direct from the Persian town of Ushnei to Rewanduz, over the Shiek Iwa Mountain, commonly called the Peak of Rewanduz—a three days' journey.

After noticing another track, or great ancient road, direct from

Ushnei, past an ancient monument and across the Keli-Shin \* he thus describes the formidable difficulties which he encountered:—

(P. 310.) *2nd July.* “We started at an early hour for the ascent of the Keli-Shin, which was performed on foot. . . . We then proceeded on our journey, and, crossing the first range, gained a country with less snow and more wood, and with many flocks of sheep and goats feeding on the mountain sides. We soon, however, came to another range with glaciers, the slope of which created some anxiety. We passed three of these, however, in safety; it was more fearful to look at another passing over them than to venture oneself; a single slip would infallibly have hurried a person to eternity. . . . We now continued our ascent of the mountain. Vast piles of snow, accumulated by the drift winds to a depth of many hundred feet, were only broken through by bold and sharp rocky pinnacles of grey and green quartz, or broken off abruptly over dark precipices of brown or blue schists. . . .

(P. 311.) “Proceeding over the first mountain we had a descent to make through a ravine filled with snow, then another ascent, steep and rocky, and another glacier, till hope deferred made the heart sick. At length we came to a precipice formed by a vast dyke of sienites, which crossed the whole crest, and constituted the peak of Rowandiz, or Sheik Iwa, as it is called by the Kurds. . . .

“The elevation of Rowandiz by boiling point thermometer we found to be 10,568 feet. . . .

(P. 314.) “After half running, half sliding, we found ourselves in an hour comfortably seated just below the inferior limits of snow, where a fire had been kindled and breakfast was prepared to reward us for our toil. . . .

“A large caravan passed along the road in the course of the morning; and indeed, notwithstanding the predatory habits of the Kurds, this is in summer-time one of the most frequented passes in this part of the country, the same merchants having recourse in severer seasons to the road by Rowandiz to So-uk-bulak. But in winter all roads are equally impassable.

(P. 315.) “The elevation of our halting place was 8,568 feet. . . . It took us four long hours’ ride to descend from our station to the head of the valley of Sidaka or Sidek. . . . Although the present castle is a comparatively modern building, the rock on which it stands appears to have been chiselled at a very remote date. . . .

“There is every reason to believe from the peculiarity of its position, as well as from its antique appearance, that it was a station or fort at the time when this was the great road from Nineveh to Ecbatana. . . .

(P. 318.) “It took us five hours to accomplish a distance of 18 miles, which led us nearly round one-half of the mountain’s circumference. We then began to descend towards the vale of Rowandiz, by a difficult pathway, carried over a shelving declivity of schists, and on which we were obliged to walk. It constitutes the second of the difficulties of this road, which are three in number, viz., the snows on the pass of Keli-Shin, the descent on slates at the foot of Ser-i-bund, and the vast limestone precipices west of Rowandiz. . . .

(P. 324.) “Passing the gardens of the town (Rowandiz), we made a descent into a deep valley with a gap through the lime ridge into the bed of the Rowandiz River; we then ascended one hour and a half to the crest of the shoulder of Sir Hussan Beg. We descended from hence one of the most remarkable precipices I have ever seen a road carried down. It was not so lofty as many in the Ti-yari; but it was nearly vertical, and upwards of 800 feet in perpendicular depth, and yet the road was hewn in the face of this precipice, along which it wound round and round, with so gradual a descent that it might be effected safely on horseback. We went fast, for we were thirsty, and the windings must have been six or seven miles in length.”

Sir Henry Rawlinson (“Journal of Geographical Society” vol. x, p. 20), visited the ancient inscribed pillar Keli-Shin (blue pillar), alluded to by Mr. Ainsworth above, and which gives its name to the pass, on the 27th October, 1838.

<sup>1</sup> Described below by Sir H. Rawlinson.



"This morning accordingly, when the weather fortunately cleared, and the wind, which had been blowing furiously for the two preceding days, appeared to have exhausted itself, I set out, attended by two horsemen, well mounted, well wrapped up, and with every defence against the snow drift, which I was told I should certainly encounter at the summit. For five miles I wound slowly up the face of the mountain, pursuing a broad open track, neither steep nor difficult, along the slope of a huge shoulder which juts out from the great range. At this point I entered the snow, and the difficulties commenced; the ravines which indented the face of the shoulder became, as we ascended higher, choked with snow, and in one of them we narrowly escaped being engulfed. At length however, alternately riding and walking, as the nature of the ground admitted, we gained a more open part of the mountain; and then, pushing rapidly on, gained the summit of the pass, exactly in four hours from leaving the fortress at its foot. The distance I should judge to be about 10 miles. I here found, upon a little eminence by the side of the road, the famous Keli-Shin, the stories of which had long excited my curiosity . . .

"At the distance of five hours from the pass (p. 22) which I ascended, there is a precisely similar pillar, denominated also Keli-Shin, on the summit of the second range which overlooks the town and district of Sidek . . . But the chief value which I attach at present to these two ancient relics of antiquity is the determination which they afford of a great line of communication existing in ancient days across this range of mountains. This line could only have been to connect two great capitals, and these capitals must then have been necessarily Nineveh and Ecbatana . . .

"During the troubles of modern times (p. 23) the track has been closed against the transit of merchandise, but Ali Pasha, in his late attack upon this country, found it practicable for artillery a long way beyond Herir, and on the Persian side it is known to be open to guns, almost to the very fort of Rowanduz. I learned from the Kurds that the only really difficult part is between Rowanduz and Herir.

Although Sir Henry Rawlinson does not speak of the latter part of this route from personal experience, his opinion on the military routes of Kurdistan is entitled to the greatest respect, as he long held a high position in the Persian service, and traversed this range in various directions in command of a mixed force, accompanied by field-guns.

*Route 20.* Next in order comes the Souk-Bulak route, alluded to above by Mr. Ainsworth as being easier than that of Kali-Shin just described.

This road was taken by Baron Thielman, the well-known German diplomate, a few years ago, and is named the Garuschin Pass. It is thus described by him ("Thielman's Caucasus, Persia, and Turkey," vol. ii, p. 88):—

"A choice of two routes exists to get from Souk-Bulak to Mosul, by way of Rewanduz. The northern route leads through the district of Sulduz, south-west of Lake Urumiyah, to Ushni (called also Ushnin), and thence crossing the pass of Kallischin, said to be 1,000 feet in height . . . then traversing the valley of Sidakatschai to Rewanduz"<sup>1</sup>

Of the southern route which he followed, Baron v. Thielman writes :

"Mahmoud (the guide) called it (the present route) the pass of Garuschin, and described the route as easy and comfortable.

(P. 91.) "Our road led (at first) up the valley of the river of Souk-Bulak, and then ascended the barren and totally uninhabited mountains on the left bank. We now rode for hours through desolate mountain regions without either variety or view. . . It was late in the afternoon when we reached the watershed of the little Zab at an altitude of 6,180 feet, and from here we had a beautiful parting glance at the lake (Urumiyah) and snow-crowned Sahend mountains . . . The district Ladishan,

<sup>1</sup> That last described by Ainsworth.



inhabited by the tribe of Balbas Kurds, and watered by the little Zab, lies at an elevation of 5,650 feet, and our descent from the watershed to the fortress of Paschy was a very rapid one. Kiepert's map shows a shorter route, but across a higher pass, leading thither from Souk-Bulak, by way of Legwin. Paschy (which the Russian map gives as Passoa, whilst Kiepert gives it Pisan or Peshwa) seemed, viewed from a distance, to possess a very defiant-looking castle. But all magnificence of aspect vanished on approaching the spot, and there only remained a crumbling wall, encircling a large open space, and protecting the little house of the Khan.

(P. 94.) "According to the description (*vide* Butler's Geo. vol. ix, p. 599) of a former traveller, who had crossed the Zagros chain to the south of the ravine, through which the little Zab flows, we now looked forward to a most difficult mountain passage. To our great surprise we reached the Turkish frontier after an hour's ascent of a steep but not otherwise arduous path, leading across a ridge some 1,200 feet in height above the valley. The actual watershed lay lower down . . . After several hours' ride through a grand but yet lovely valley, we reached Rajat, the Turkish frontier village . . .

(P. 96.) "To-day's journey conducted us through the most romantic scenery which I saw between the Caspian and the Mediterranean. The valley of the Rewanduzschai abounded in beautiful views. At one time lofty snow mountains pierced through side ravines of wild grandeur, then the valley widened into small recesses, in which nestled pleasant villages with rich gardens, half concealed beneath the shade of planes and elms, and encircled by neatly tilled fields; the oaks are of more than twenty different kinds . . .

(P. 97.) "We inferred that the lofty snow-capped cone visible through the side valley on our right, and which was not unlike the Matterhorn, must be the Sheik Iwa, the northern side of which is crossed by the pass of Killischin . . . The road was good, and the bridges over the roaring Rewanduzschai, which we had several times to cross, were in fair condition, the last bridge merely consisted of two stems of trees resting on one pillar, but our horses stepped along it without the least hesitation.

(P. 98.) "The next morning a steep and tortuous path brought us to one of the heights which enclose the hollow of Dergala, and thence down into the valley of an affluent of the Rewanduzschai. The latter descent over a path scarcely a foot wide, covered with loose stones and bordered by a precipice, was the only hazardous passage during the whole journey from Tabreez to Mosul; in rainy weather it must be quite impracticable. We prudently dismounted and left our horses to find their own way down. They picked their way very quietly and sagaciously down the narrow path . . .

(P. 99.) "The valley was enlivened by large flocks of sheep and goats which, driven by curiosity, ran after us. Shortly afterwards we reached the main valley and continued along it, till we arrived at the town of Rewanduz.

"We left the town (p. 104) by the elevated southern extremity, and at first descended into a very peculiar oval-shaped hollow of the rocks, which communicates with the valley, or rather the ravine of Rewanduz, by a perpendicular crevice only a few feet broad.<sup>1</sup> A steep and stony path led out of the hollow to the left bank of the Rewanduzschai . . .

"A narrow but tolerably good foot-path brought us down to the ravine; but this is the only means of communication between the district of Rewanduz and the outer world."

The next group of passes which claim our attention are those leading from Persian territory through the Zagros range, and converging on Sulimaniyah, an important Turkish frontier town, from which numerous roads diverge to Mosul and Baghdad.

Sulimaniyah has, like Amadiya and Rowanduz, been reduced, during the present century, from an independent Kurdish district under its hereditary feudal chieftain, to a tributary Pachalik of the province of Baghdad.

<sup>1</sup> See Ainsworth's description of his descent by an ancient road on the face of the cliff.

*Route 21.* The most westerly of these passes was taken by Sir James Ker Porter ("Travels in Georgia, Persia Armenia, &c.") on his return journey to Souk-Bulak in December, 1822.

Leaving Sulimaniyah on 12th December, just as the winter was setting in, he started on his adventurous journey. After two days to Marut, the serious difficulties began in surmounting the spur which separates the Kyzylchy Chai from the Banna Rud River—

The following is his description of the two days' march from Mosnair over the Daroo Mountain (p. 463):—

"Words cannot paint the difficulties of this pass. The road over which we clambered was actually over naked and slippery marble rocks . . . Every mountain I had hitherto crossed, through the whole range of Caucasus was security and ease of travelling compared with the actual dangers of this. One slip of man or beast was destruction; yet to my unceasing astonishment, notwithstanding the nature of these obstacles, even our laden mules made their way with an ease and sure-footedness which seemed miraculous.

(p. 473) "December 16th. From Baytoosh over Daroopeak. Had I been aloft in a balloon, I could hardly have felt more abandoned to the great gulf of air above the clouds; all around was so steep and bottomless . . .

"We cautiously followed each other over these points of particular danger, but most of the Kurds undauntedly kept their saddles, passing over our fearful impediments with a firmness and lightness which could not fail reassuring our resolution."

The gathering snow storms which threatened to break over the travellers, and might have caused their destruction in the mountains, fortunately held off till they gained the plains of Persia.

*Route 22.* We have now to notice an adventure more daring even than the last, of which Mount Zagros, a little further east, was the scene. Captain (afterwards Major-General) Mignan, of the Indian army, returning to India in 1839, travelled across Russia with his wife, two children, and an English maid. After narrowly escaping being lost in a snow storm in the Vladikaukas Pass in December, which destroyed a large Russian detachment, they pushed on through Tabreez, down the eastern side of Lake Urumiyah, past Bogaun (Burchan) to Miraady (Miradeh). Thence by Banna and Beestan to the capital Sulimaniyah (where he arrived early in April) by the only pass open in winter, his family accompanying him in mule panniers.

He thus describes ("Winter Tour into Kurdistan," by Captain Mignan, p 277) the passage of Mount Zagros, which he found far more difficult than any part of the Dariel (or Vladikaukas) Pass:—

"We started soon after daybreak to cross Zagros and proceed to the capital of the kingdom. The morning was unusually sultry, and during our journey a dreadful storm of rain, hail, and sleet, accompanied by violent gusts of wind, thunder and lightning, broke upon us. We were soon enveloped in a thick fog which reminded me of the situation of the 10,000 Greeks under Zenophon during their ever-memorable retreat over these very mountains. They were hidden from the enemy by a mist similar in density to the one which we now experienced; for we could not see the road-side although we were only two yards distant . . . The road was so slippery as to render the utmost caution necessary, as all around was Stygian darkness . . . Having reached an immense height, the clouds suddenly swept away, and a vast extent of mountain ravine and glen lay exposed to our glance, but they were again as quickly obscured by the passing clouds."

Three separate ranges had to be crossed before reaching  
VOL. XXII. N

Sulimaniyah, the capital of the kingdom, each pass occupying a whole day, the second of which was enlivened by an encounter with the armed mountaineers, who barred the way and resisted his servants. Captain Mignan only forced a passage pistol in hand.

It is worth while to notice here in passing, the effect of a more southern climate in reducing the close season in these mountains to about four months, whereas in the neighbourhood of Lake Van it would probably be extended at least a month longer both in autumn and spring.

It only remains now to notice the journeys of Mr. Rich, our Consul at Baghdad in the early part of this century, who travelled in search of health through Sulimaniyah to Senneh in Persia, accompanied by Mrs. Rich and a retinue of Baghdad and Indian servants, during the summer of 1820.

*Route 23.* His party being worn out by fever in the hot valley of Sulimaniyah, he started, on 17th July, over the Giozheh Pass, as being the easiest by which to cross the chain, or rather wall, of bare hills which bounds Sulimaniyah on the east. ("Rich's Residence in Koordistan and Nineveh," p. 159.)

"We reached the foot of the hills by a gentle rise all the way up from Sulimania a little after 4 A.M., and immediately began the ascent, first in the dry bed of a torrent, and then along the steep face of the hill, by a very narrow and precipitous path . . . It (the baggage) had had a difficult passage over Giozheh, and two or three of the baggage mules got a roll down, but fortunately no serious accident occurred.

(P. 162.) "As we had been told at Sulimania that the roads over which we were to pass were very steep, rough, and precipitous, and in some places in the mountains so narrow that two horses could not go abreast, we were obliged to abandon the Takht-revan (mule litter) and mohaffas on this excursion, leaving them behind us at Sulimania. The women servants were sent off on horseback last night with the tents and baggage. Mrs. Rich accompanied us on her pony, a present from Osman Bey, which carried her over the mountains admirably . . .

(P. 166.) "From the banks of the Tenguze, we rose immediately by a very steep ascent, which occupied thirty minutes, at a good hard pull . . . We found the road to-day excellent, and much better than I had seen in any part of Asia Minor. Some of the views down into the valley reminded me of the Jura . . .

(From Doladreich.) (P. 188.) "We soon began a very steep ascent, I think the highest and steepest I had yet seen, but the road was excellent. We attained the summit at six, the ascent having occupied about forty minutes, for half an hour of which it seemed, as we toiled up, to be almost perpendicular . . . We immediately began to descend by a beautiful and excellent road, among a thick forest of oaks, through which it ran in a zig-zag direction, and was not so steep as the ascent . . . Penjineen is the emporium of the wandering tribes.

(P. 184.) "Caravans go from hence to Hamadan in eight days, to Sinna in four . . . There are some families of Jews here, who trade in gall nuts, hides, &c. with Sinna and Hamadan. Many hides are exported to the latter place. The village Jews of Koordistan are also dyers . . .

(P. 191. From Gueizawera). "We were off at 5 A.M., and proceeded through a hilly but open country till six, when we came to the entrance of a narrow valley, formed by two stupendous cliffs, which reared their bare heads above the oak woods that cover their declivities. The small river of Aserabad, or Gurran, flows through the pass, and is crossed by a neat bridge of three arches . . . the road extremely beautiful, through woods of oak, ash, wild pear, vine and tchinar, or oriental plane, which cover the hills almost to their summits, and among them we noticed hawthorn and gigantic wild rose. It was enlivened by a large division of the Jafs, proceeding to the plains of Zeribar, with their families and flocks. Their property was loaded on bullocks . . .



(P. 192). "The road was excellent, the vale through which we ascended very narrow. At ten minutes before eight we came to the foot of a very steep ascent in the same direction, the road not winding much; at a slow progress it occupied us forty-five minutes in ascending. The mountains were gypsous and slaty. At 8.30 we reached the top of the Col, and saw higher summits on either hand quite bare. We almost immediately began descending by a steep path, the wood becoming more rare, and was confined to the dwarf oak . . . At five minutes past nine we reached the foot of the pass. This pass of Zagros is called Garran, the name of a peer, or saint, as I am informed, though it is certainly no Mahometan name. The pass of Ardbaba to Bauna is reckoned easier."<sup>1</sup>

I have given extracts from this itinerary at considerable length, to show the importance of this route, the chief and easiest communication between Sulimaniyah and Senneh, from which roads diverge to all parts of Persia, including Rescht, Teheran, Kermanshah, and Ispahan.

The last route which we have to notice is that by which Mr. Rich returned to Sulimaniyah from Senneh. Leaving the plateau on which he crossed the head-waters of the Kysyl Uzen River he entered the mountains at Kara-Bokra. At Banna he crossed the route taken by Captain Mignan, then, following the Banna Rud River as far as Merwa, he turned due south to Sulimaniyah.

After stating that "from Kara-Bokra to Serkhuan-i-Shelal, the capital of Teratul, is four hours, thence to Beestan four hours," he thus describes his road from Kara-Bokra:—

(P. 233.) "At five minutes past seven we began to descend by a good road. Upon reaching the bottom we found ourselves in a narrow, rocky valley, or rather ravine, among the hills, in which we continued the rest of the day, to our infinite trouble. The road continually ascended and descended along the steep sides of crumbling slate. The path was narrow and shelving; indeed it was nothing more than a sheep-path, with a precipice on the left hand. The Koords even confessed it was the most disagreeable road they had ever travelled over, and, for the first time, at a bad pass, I saw them dismount. Omar Aga's horse fell with him once, on the very edge of the precipice; he very adroitly threw himself off at the moment without quitting the bridle, otherwise horse and man must have been killed. My head turned so much that I was obliged to walk the whole way from the foot of the mountain to the end of the march . . . .

(P. 234.) "From the mountain we saw Mount Kelli Khan, and Mount Zagros, or a part of it. We reached the foot of the mountain at 7.35 A.M.; and soon after came to a miserable little village named Hajee Mahommed. Thence, rising a little, we dropped at once on the village of Soota, by a most horrible break-neck descent, with a precipice on our left hand.

(P. 335.) "At 2 P.M. we mounted, I may say marched, for I did not take to my horse the whole way on account of the precipices, which were too much for my weak head.

(P. 239.) (From Meek.) "At 11.45, without having ascended considerably, we reached the top of a very steep descent, I think the steepest we had yet met with; it occupied half an hour, and is called Kelleh Balin. Both Omar Aga and Abdullah Bey agreed in saying it was a pass of Zagros."

From this pass the road presented few difficulties of a serious nature, until within a few miles of Sulimania, where a part of the track over Mount Azmir was found out of repair, and a party passed over on foot, leaving their horses to follow alone. The general nature of the Sulimania district, after turning south from Merwa, formed a striking contrast to the inhospitable mountains of Persia. All along the route innumerable springs gushed from the mountains, which were clothed

<sup>1</sup> Described above by Captain Mignan as very difficult.



with forests of oak, while the villages, surrounded with walnut-trees, gardens, and vineyards, made up a scene at once grand and beautiful.

With regard to this last group of passes leading to Sulimania, it will be observed that three out of the four have been crossed by English ladies, and we may therefore infer that they would not be found impassable by mountain artillery. And in endeavouring to form a just estimate of the difficulties described by travellers, we should not fail to remember that the impression left on the mind by mountain gorges, precipices, and glaciers, more especially if approached direct from the plains, depends to a great extent on the state of the observer's health and nerves, as affected by such climates as those of Mesopotamia and Assyria.

Where we hear of caravans of laden mules and cattle passing, and of the natives making their journeys on horseback, it may be presumed that a well equipped mountain column could follow.

And here the survey of the passes of Kurdistan may be fitly brought to a close, as the great trade and caravan routes converging on Bagdhad from the plains of Persia, through Kermanshah and Zohab, are too well known to require special notice.

In this region the mountain barrier sinks nearly to the level of the great plateau of Persia, 5,000 feet in elevation, offering no obstacle to a descent into the plain of Bagdhad.

Nor does it come within the scope of this article to discuss so vital a question of Imperial policy as where, or how, the defence of Bagdhad may be conducted, should the command of the Persian Gulf be hereafter threatened.

Let us, therefore, turn to the consideration of the physical and moral influences which might be found to favour a Russian descent on the Tigris Valley.

There is first the important fact that the level of Lake Van is upwards of 5,000 feet, and that of Lake Urumiyah 4,000 feet, above the sea; while the following are the elevations of the principal towns from which an immediate advance would probably be made upon the passes.

Erzingan	..	..	..	4,200 feet.
Mush ..	..	..	..	4,200 "
Bitlis ..	..	..	..	5,100 "
Ushnu..	..	..	..	4,900 "
Souk Bulak	..	..	..	4,400 "
Sakkyz	..	..	..	5,300 "
Senneh	..	..	..	5,800 "

Thus, as a rule, the greater half of the ascent would be already gained, leaving from 3,000 to 5,000 feet to be surmounted.

The climate, too, may be considered an important ally of the invaders, who might choose for the beginning of their operations those months of the summer when the northern valleys would be bearable, if not actually pleasant; while the bulk of the defenders would be exposed to oppressive heat, at elevations of 2,000 or 3,000 feet on the southern

slopes; or the actual passage might be deferred till the climate of the lower plains becomes suitable for operations in the autumn.

Nor need the question of supplies present insuperable difficulties, if the sympathy of a portion of the population were secured; for it has been computed by Major Millingan that the Kurdistan Range supports no less than (40,000,000) forty millions of sheep, from which Damascus, Baghdad, and the other cities of the plains derive their supplies. The valleys we know to be of great richness and often well cultivated.

No advance would of course be attempted by Russia until she had time to organize her communications with the above entrepôts—by means of serviceable roads—from Georgia through Erzeroum and Tabreez, and from the Caspian by Rescht.

But Russia might hope to find her most powerful ally in the anarchy prevailing among the various races and creeds, and the bitter hostility entertained alike by Kurdish clans, Kissilbash or Yezedi pagan tribes, and by Chaldean and Armenian Christians, towards the Osmanli Turks, who are regarded by one and all as foreign oppressors.

The works which have been quoted above show that, along the whole range, the independent tribes have been only brought under the authority of the Ottoman Government during the present century, and in many cases during the last thirty years; and that this has been effected by the usual agency of fomenting the jealousies of neighbouring sects and by inciting them to mutual extermination.

Mr. Taylor has told us of the Kissilbash tribes maintaining their independence in the fastnesses of the Deyrism Dagh and of the Kurds on the Dibenah Su; while both he and Mr. Layard notice the numerous and industrious Armenian population ground down by the oppression of their Kurdish masters in the remote valleys south of Lake Van. Both Mr. Layard and Mr. Rich seem to have interested themselves in the condition of the Yezedies, scattered through the districts of Saert and Mosul—a sect who have survived the systematic barbarities to which they have been subjected through the detestation in which their peculiar heresy is held by Kurd and Turk alike.

Russia has taken advantage of these persecutions to offer the Yezedi fugitives an asylum on the northern slopes of Mount Ararat, where they guard the frontier against the incursions of the Kurds, and she has thus secured to herself allies far within the Turkish frontier.

It is sad to contemplate the change in the condition of the Chaldean Christians of the Zab-Ala Valley, since 1843. Mr. Rich speaks of them in 1820 as a formidable independent tribe holding the neighbouring Kurds in awe; and Mr. Ainsworth had proof of their martial spirit in 1843, while the first massacre was hourly expected.

For the account of the massacre of 1846, by Beder Khan Bey of Rewanduz, I would refer my readers to "Nineveh and its Remains" (vol. ii, Chapter VII), which brings forcibly to mind the spring of 1876, when the Balkan Valleys were the scene of similar outrages. The deplorable state of the district is also forcibly described by Mr. Layard, ("Nineveh and Babylon" abridged edition, pp. 232—236,) after revisiting the tribes in 1850. And this, be it remembered, is no highly,

coloured picture drawn by a Russophile partisan in the heat of controversy, but the dispassionate narrative of a distinguished diplomatist whose knowledge of Asiatic Turkey is probably unequalled by that of any living Englishman.

The total population of the independent Chaldean Tribes, in 1830, was given on the authority of their Patriarch ("Missionary Researches in Armenia," Messrs. Smith and Dwight, p. 294), at 70,000 souls; but this was held by the English Consul at Tabreez at the time to be an under-estimate. Their present numbers have been given by recent authority at 100,000.<sup>1</sup>

These primitive Christians do not appear to extend to the east of the Rewanduz district; but we have ample testimony from Mr. Rich of the disaffection which was openly expressed by the Kurdish feudal chiefs round Sulimaniyah towards the Turkish Government during his sojourn among them in 1820.

Captain Mignan, however, found the district of Sulimaniyah practically independent nineteen years later; for writing in 1839 ("Winter Tour into Kurdistan," Mignan, p. 285) he says:—

"The government of Sulimaniyah is administered by a Pasha who is by birth a Kurd, subject to neither Turk nor Persian. To please the Russians he has occasionally sent a present in cash to the Prince Royal of Persia; and Marshal Paskiewitch is desirous of taking him under his especial protection that, in case of need, he may be induced to furnish cavalry to harass, by their repeated incursions, the inhabitants of those countries by which they are bounded. For such duty they are eminently fitted. A Kurdish chief assured Fraser that if 1,000 Europeans, of any nation, made their appearance amongst them, 20,000 Kurds would immediately rise and join them."

"It may thus be said that the sound of Marshal Paskiewitch's victorious columns, advancing through Azerbyan, penetrated the fastnesses of Mount Zagros and found an echo 200 miles off, beyond the Turkish frontier.

Mr. Fraser ("Historical and Descriptive Account of Persia," by Fraser), in 1834, in his journey from Souk-Boulak to Sulimaniyah, seems to have followed almost the same route as that taken by Sir James Kerr Porter, twelve years before, *via* Seradust. But he found the Pashalic in the occupation of the Persians, who had recently overrun and almost depopulated it. At Seradust alone 1,000 of the inhabitants had perished from cold and famine, and it has probably never recovered the prosperity which it enjoyed at the time of Mr. Rich's visit.

History would seem to teach us that the true value of an extensive mountain range, as a barrier to invasion, rests chiefly on the measures which the defenders can adopt to strengthen it by their own military resources, or by the active co-operation of the inhabitants.

What resources Turkey may hereafter command on this part of her Asiatic frontier, it is not our province here to discuss, but we see from the concurrent testimony of all the travellers who have had the means of forming an opinion, that Russia, once in possession of the northern outlets of the mountains, would find ample materials ready

<sup>1</sup> Sir G. Campbell.

to her hand for alliances and intrigues among the actually, or till recently, independent tribes along the whole length of the chain.

Nor must we lose sight of the fact, an instance of which we have seen in the long-concealed highway through Deyrism Dagħ, that the exactions of such a government as Turkey may make it the interest of the mountain tribes to oppose, rather than to facilitate, the opening of their passes. We have therefore probably no right to assume that, because only certain practicable roads are known to the provincial authorities, there may not be others equally practicable and perhaps equally numerous, which they have either never heard of, or never dared to explore, but which would be disclosed to an invader commanding the sympathies of the inhabitants.

It is obvious that, for many years after reaching the frontier indicated, it would be neither in the interest nor the power of Russia to attempt a descent on the plains of the Tigris; but it would be only in accordance with her practice in Asia to endeavour, under pretext of encouraging trade, to improve the tracks on her side of the passes, and to send forward agents to establish friendly intercourse with, and eventually a protectorate over, her neighbours on the southern side.

Separate or simultaneous encroachments might then be pushed forward upon such important strategical points as Masgerd, Palu, and Husru, threatening Diarbekr; Saert and Julamerg, east and west of Mosul; or upon Rewanduz and Sulimaniyah towards Baghdad.

Once in possession of these intermediate places Russia might wait her leisure to improve the roads and to profit by the necessities of Turkey before venturing on more important acquisitions.

*16th January, 1878.*



CANADA.

DOMINION ARTILLERY ASSOCIATION.

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PRIZE ESSAY.<sup>1</sup>

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ON THE SUPPLY, CARE, AND REPAIR OF ARTILLERY-MATERIAL, INCLUDING SMALL ARMS AND AMMUNITION FOR CANADIAN MILITIA.

By Captain and Brevet Lieutenant-Colonel C. E. MONTIZAMBERT,  
"B" Battery, Canadian Artillery, School of Gunnery, Quebec.

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*Extract from General Orders, 23rd March, 1877.*

DOMINION ARTILLERY ASSOCIATION.

MEDAL FOR ESSAY.

His Excellency the Earl of Dufferin, K.P., &c., Governor-General of Canada, has been graciously pleased to express his intention of offering a medal for the best essay on the supply, care, and repair of artillery-material, including small arms and ammunition for Canadian Militia, to be competed for by Officers of the Canadian Militia Artillery, being members of, or belonging to, corps affiliated with the Dominion Artillery Association. Officers or others who have served in the Royal or Royal Marine Artillery to be excluded from competition.

The essays to be distinguished only by a motto, not that of any Artillery corps, and the manuscript not to be in the handwriting of the competitors.

The essays to be sent to the President of Council, Dominion Artillery Association, Quebec, before the last day of July, 1877.

The judges to be Officers of the Royal Artillery, viz.:

The Inspectors of Artillery and the Professor of Artillery, Military College, Kingston.

The essays may be in English or French; subject matter will be considered of more importance than style. Quotations and extracts from works bearing on the subject may be freely made use of, but the names of the authors so quoted must be given in foot or marginal note.

The best essay will be printed at the expense of the Dominion Artillery Association, and distributed to members.

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"Potz blitz! Das ist ya von Gustle aus Blaserwitz!"—*Schiller*.

ON the withdrawal from the Canadian Dominion of the Imperial Legions in the fall of 1871, a transfer was made of a considerable amount of warlike stores and material from the British to the Canadian Government, of which the late Sir George Cartier was then

<sup>1</sup> Reprinted at the suggestion of the President of the Association.

Premier and Minister of Militia and Defence; Lt.-Col. Robertson Ross (late 25th King's Own Borderers), being Adjt.-General, and Col. Powell, Dep.-Adjt.-General of Militia, Lt.-Col. Wily, Dom. Mil. Storekeeper, took over the material transferred, and was assisted by Lt.-Col. French, R.A., C.M.G., then Lt. French, R.A., and Fire-master of the R.A. Brigade, then stationed at Quebec), in matters connected with the Artillery branch.

After the march out from the Citadel of Quebec of three batteries of the 3rd Brigade Royal Artillery, three companies Royal Engineers, and the 1st Battalion 60th Royal Rifles, under Col. Gordon, the last British troops quartered in the Canadas, the keys of the strong old Keep were handed over by General Hamilton, R.E., Commandant, to Lt.-Col. Strange, R.A., who, with an incipient battery of Canadian gunners, undertook the important duties of the garrison of Quebec, and has ever since kept flying over the Citadel that glorious flag the Union Jack, which for so many years has, without interruption, floated proudly on the grand old fortress.

Portions of the then existing armaments at the military posts, St. John, Quebec, Montreal, Kingston, and Toronto, came to us as a free gift, and the roll-books, imposing enough as far as the number of pieces of ordnance is concerned.

We took over at St. John, N.B. ....	26 pieces.
"      "      Quebec .....	187 "
"      "      Montreal .....	33 "
"      "      Kingston .....	85 "
"      "      Toronto .....	9 "

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340 in all.

With the exception, however, of ten 7" Armstrong B.L.R. guns at Quebec, these consisted of old S.B. cast iron pieces, guns, carronades, howitzers, and mortars.

#### *Garrison Artillery.*

The guns, 68, 56, 32, and 24 prs., are of little use where now mounted, and are to be replaced in the principal fortresses by more modern weapons; those S.B. guns would be useful for the armament of gunboats on the lakes, nothing much heavier being likely to be brought against them on those inland waters.

Predominance on the upper lakes, especially on Lake Ontario, is of the first importance. On this subject, Col. Fletcher, Scots Fusilier Guards, late Military Secretary to his Excellency the Governor-General, says in a very able lecture on Canadian Defence:—

*"Coûte qui coûte*, the command of Lake Ontario must be secured and maintained, . . . and, above all, Kingston would have to be placed beyond the possibility of capture."

Of the 68-prs. there are two mounted in coast batteries at St. John, N.B.

The 56-pr. class is represented by one gun in Fort Henry, at Kingston, where it would doubtless give a good account of anything

likely to be brought against it; not so with the heavier 68-prs. at St. John, that port being open to the attack of armoured cruisers.

The carronades and howitzers, firing charges of case and grape, would answer very well for the flank defence of ditches and curtains, and those in artillery charge are, most of them at present, mounted in positions for that purpose. In more modern armaments the caponnières would be armed with Gatlings, probably of a calibre sufficiently large (say 65) to allow of the bullets breaking scaling-ladders.<sup>1</sup>

The mortars given over were 13'', 10'', and 8'', land and sea service.

There are also 12 and 18 pr. siege guns, one battery of the latter, with carriages and waggons complete, at Quebec, and another at Montreal.

Formerly, the Royal Artillery had 40-pr. wedge Armstrong R. siege guns; these are about the same weight as the old 18-pr. S.B., and are, of course, an infinitely superior arm for the purpose for which they are intended; none of them, however, were left in the country on Dominion charge.

Of the ten 7'' B.L.R. ordnance, four are mounted *en barbette* on the salient bastions of the Citadel of Quebec: three with their stores, carriages, platforms, and racers, are lying, one in each of the splendid forts at Point Levis, opposite Quebec, but as yet the necessary concrete platforms have not been laid down.

The caponnières of these forts are armed with sixteen 32-pr. carronades; a poor substitute for the complete armament of rifled guns offered as a free gift by the Imperial Government, which was as follows:—

	On B. Traversing Platforms.	On Traversing Carriages.		
No. 1 Fort ..	7 7'' B.L.R.	4 40-pr. B.L.R.	8 10'' mortars	12 capr. guns.
No. 2 Fort ..	10    "	"    "	7    "    "	10    "    "
No. 3 Fort	10    "	"    "	7    "    "	10    "    "

One of these guns is lying in the park of the old Artillery Barracks at Quebec, intended to be mounted in an angle of the works commanding the head of Dorchester Bridge—the only approach to the city from across the St. Charles River. Before leaving, the Royal Engineers laid down the racers for this gun, but the concrete has never been filled in. The remaining two were sent, in 1874, to Kingston, where they now remain in charge of "A" Battery School of Gunnery.

This class of gun is almost obsolete in the British service. It is a good gun for land defence, is extremely accurate, and from the comparatively large capacity of its common shell, which weighs, filled, 98 lbs., bursting charge 7 lbs. 10 oz., would be very effective against

<sup>1</sup> An exhaustive pamphlet on "Mitrailleuses or Machine Guns," has been written by Capt. J. F. Owen, R.A., Capt. Inst. Royal Gun Factories, and their tactical use treated of in a lecture, entitled "The Gatling Gun: its Place in Tactics," by Capt. E. Rodgers, F.R.G.S., Journal of the Royal United Service Institution, No. LXXXII.



earthworks. The other projectiles used with this gun are segment and shrapnel shell and case shot. We have no 7-inch shrapnel in the country. Large quantities of this projectile are, or were lately, lying piled in Woolwich Arsenal, and probably might be obtained at a low cost. The complicated and delicate breech mechanism is against the gun, and has been known, in the severe winters of this climate, to become immovable, from the oil or drifting snow freezing between the bearings. An Armstrong armorer and peculiar tools are needed to keep it in order; the vent-piece requires constant attention, and the special stores and fittings used with it are many and varied.

Some years ago, two 64 32-pr. Palliser converted, and three S.B. 32-prs., with their carriages and stores complete, were handed over by the Imperial authorities at Halifax as a free gift to the Dominion. They have been mounted for drill purposes by the Artillery, and form an addition to the heavy ordnance on Canadian charge.

There are also three 32-prs. and an old iron 6-pr. mounted on an earthwork commanding the entrance of the bay of Charlotte Town, Prince Edward Island.

### *Field Artillery.*

There are in Canada sixteen batteries in all. Until 1871, these corps, with one exception, were armed with S.B.M.L. bronze pieces, three guns and one howitzer to each battery. Since then, however, they have nearly all been provided with the latest 9-pr. M.L.R. gun of 8 cwt., and the most modern wrought iron carriages with Madras wheels from the Woolwich Royal Gun and Carriage Factories.

There are sixty of these guns now in use by the Canadian Militia. The 9-pr. of 6 cwt. would perhaps have suited our purpose better.

The Halifax Field Battery alone was then, and still is, served out six of the B.L.R. 6-pr. guns of 3 cwt. (Colonial Service).

Waggons were not imported with the 9-prs., with the exception of four which were given to the London Field Battery.

The two Schools of Gunnery have also these guns, and there are four at Red River, in possession of the Winnipeg Field Battery.

The North-West Mounted Police have in charge four 7-pr. M.L.R. mountain guns, 200 lbs. weight, and two 9-pr. 8 cwt. M.L.R. guns. There are no other pieces in the north-west belonging to the Dominion except a few S.B. bronze field guns and some Coehorn mortars at Fort Garry, Manitoba.

During a late discussion before the members of the Royal Colonial Institute, on Capt. Colomb's paper on "Imperial and Colonial Responsibilities in War," Capt. Bedford Pim, M.P., expressed indignation at the supineness of successive Governments with reference to "the defenceless state of Vancouver's Island, the depôt for all the stores for our naval forces in the Pacific. If Russia within the next few months were to declare war against us, Vancouver's Island, with all the stores, would be at her mercy. As to our fleet, Russia having a larger force and means of telegraphic communication with them, which were not at our disposal, would be able, long before our ships



“on the Pacific station could hear of the declaration of war, to dis-  
“pose of them in detail.”

Our fellow-countrymen in British Columbia generally are alive to the fact of their having no adequate supplies of material wherewith to defend themselves, and several articles have of late appeared in the papers on the subject.

At St. John's, Quebec, and Montreal, points liable to be attacked by armoured ships, some of the heavier guns should be mounted, such as those at Halifax, 12, 18, and 25-ton guns; notably on the formidable fortress of Quebec, the key of Canada, where there is a battery of Canadian Artillery to take care of and, if necessary, use them.

The fifteen 64 32-pr. R.M.L. Palliser converted guns of 58 cwt., now arriving, will be a great accession to the Canadian armament; but they are now used as shell guns only in the English service, and no Palliser projectiles have been sent out with them. With the Palliser chilled shot and a battering charge they could pierce, at short ranges, the weaker ironclads.

From the high command of the Citadel of Quebec, projectiles from these guns aimed at the decks of ironclads would tell with good effect. A vessel's deck, when approaching bow on, offers a favourable parallelogram of error, elevation being a far more difficult matter than direction.

The fact that the present supply of 32-pr. carriages and side-arms would answer also for these guns was an economical inducement for their purchase.

Some guns of a heavy nature mounted à *fleur d'eau*, at Indian Cove, or at the head of the Island of Orleans, would command the channel.

It is to be hoped that the 64 32-prs. are but the *avant-garde* of some of their larger brethren, and that the eastern cities of the Dominion may be put in a position to reply in a sterner tone if called upon to speak at all—an event in these warlike times perhaps not wholly improbable.

L'Aîné in his “Aide-mémoire portatif du génie” (Paris, 1861), lays down the formula for the whole number of guns to defend a bastion fort, as follows:—No. of guns =  $146 + 5 (M.-2)$ , M. being the number of bastions. Taking the fortress of the Citadel of Quebec with five bastions we would have  $146 + 5 (5-2) = 161$  guns.

It is to be presumed that this formula would still hold good unless there existed a great difference in weight of metal between the guns of the besiegers and besieged. The stronghold just alluded to is armed, at present, with nine of the weakest class of garrison rifled guns in the service and a few obsolete smooth-bores.

The armament proposed for this fortress by the Imperial Government was as follows:

For Quebec Citadel and works facing the river, as approved 9/5/68, Canada,  $\frac{5}{913}$ :

9" M.L.R.	12 tons	9
7"	7	4
7"	82 cwt.	13

Caponnière guns .....	39
64-pr. B.L. ....	9
24-pr. S.B. ....	10

As long as our present relations with the Empire continue, it is scarcely likely that we shall go into the manufacture of cannon, or even military small arms, however desirable it may be that the material used with them should be made in this country.

### *Ammunition.*

The supply of ammunition and artillery-material generally is exceedingly small. From the reports of Lieut.-Colonel Wily, Director of Stores, it will be seen that about 100 rounds per gun for land and 200 for coast defence was given us in 1871.<sup>1</sup>

Since then a considerable quantity of shot and shell has been expended at practice by the different batteries; what ought to be the service ammunition having to be so used, as there is no proper reserve in the country.

Cartridges are made up in the Laboratory at Quebec by the men of the Gunnery School, and supplied to the Dominion.

There is a proportionate supply of fuzes, tubes, &c., they are not, however, improving with age, and their district distribution is rather eccentric.

The regulations on this head for the Royal Artillery are given in Army Circular, War Office, 1st December, 1876, Clause 170, as follows:

“Garrison Artillery.—Fuzes and Tubes.—1st. The proportion of fuzes and tubes to be maintained for Garrison Ordnance will be as laid down in the details contained in the Equipment Warrant, 1876. (Revised Army Regulations, vol. III), pages 59 to 76. 2nd. Half of these proportions will be in charge of the Royal Artillery; the other half will, in time of peace, be held in reserve, by the Ordnance Store Department, at the dépôt upon which the forts and batteries are dependent for their supplies.”

The Boxer wooden time fuze gets to burn slowly if kept too long, possibly from the sulphur in the composition deteriorating. These fuzes might with advantage be made in the country.

The 7" B.L.R. gun here has for its percussion fuze only the old obsolete Pillar fuze, fitting the Moorsom gauge of the shells on charge. These fuzes, besides being obsolete, are not now reliable from sheer old age. The Dominion Inspector of Artillery has applied for a supply of Pettman's G.S. percussion fuzes for these guns, and there should be a store of them on hand.

The wooden carriages, gyny, quoins, tampions, skidding, levers, handspikes, platforms, sponge-staves, rammers, and wooden stores generally, which are used with garrison and field guns, are decaying and being expended by wear and tear throughout the country, and there is no provision at present for their being replaced by any manufacture in the Dominion. We ought not surely to import wood goods into Canada at a cost of probably about three times that at

which they could be made here, the staple export of the country being timber.

Of the woods used for military purposes we have oak, beech, ash, rock-elm, fir (pine and spruce), cedar (for ammunition boxes, fittings, &c.), chesnut, hickory, birch, rock-maple, walnut, and for ground platforms, juniper, hakmetack, &c.

It is said that a ship came into Halifax a few years ago from England, laden with birch-brooms, step-ladders, brushes, scrubbers, broom handles, &c., for the use of the troops, and it is a matter of history that the flagstaff of the Citadel of Quebec had to make two voyages across the Atlantic before being qualified for its present elevated position.

Within our own Dominion we have also mines which can supply iron equal to any English or other obtainable—notably the mines and works at Londonderry, Nova Scotia, which turn out iron and steel of the finest quality.

#### *Supply of Small Arms.*

There are at present in Canada about 80,000 stand of Snider-Enfield rifles, long and short, serviceable and *unserviceable*; also 2,500 new Martini-Henry rifles of the pattern now in use in the British service. The latter have not as yet been issued, and it may become a question if they ever should be, unless the arm is adopted *in toto* and supplied to all rifle corps of the Volunteer Militia. Confusion in the supply of ammunition might possibly happen, and would not be a good feature.

Besides the above, arms and accoutrements for 1,000 men were sent in 1872 to Victoria, British Columbia.

The Snider-Enfield is an excellent soldier's weapon, and is most specially suited to the Volunteer services. The mechanism is simple, strong, and little liable to get out of gear, and when it does so, it is easily repaired.

As an arm of precision, it is wonderfully good up to any range likely to be often required in a thickly wooded country such as Canada.

Although having a slow twist in the rifling, and a cartridge containing only a charge of  $2\frac{1}{2}$  drachms of F.G. powder, with a cylindro-conoidal bullet of .577 diameter, great accuracy is obtained by the hollowing out of the centre of the bullet, giving increased centrifugal force. The space left in the head of the ball used to be filled up by a wooden plug, but in the latter make this space is left void, and the top is spun over with lead. The open space in the centre of the base is filled up with a pressed clay plug.

Including the Reserve Militia with the active force, the number of fighting men in Canada liable in case of war to be called out, numbers some 600,000 to 800,000 men; should there not be a far larger number of rifles in the country?

There must be in store in England any amount of serviceable Snider-Enfields which have been replaced in the Army by Martini-Henrys. Could not a number of the former, sufficient to form a



proper reserve in Canada, be obtained from the Imperial Government by the Dominion at a low cost?

The Martini-Henry has certainly a flatter trajectory and longer range, but it is a more expensive and complicated arm, and has also a much greater recoil, probably owing chiefly to the high pitch of the rifling. This latter point is very much against it. No ordinary soldier will ever make cool and accurate shooting with a kicking weapon.

For pistols we have only a small supply of old Colt's revolvers, using the obsolete cap and paper cartridge. We ought to have Adam's Army Service pistol, a breech-loading central-fire revolver with copper cartridges.

The Snider ammunition has so far been all supplied by purchase from the Imperial Government; much of it is very old, and greatly deteriorated. That of mark IV, V, and VI, some dating back as far as 1862, is not to be depended on, and now for rifle matches a later make up to mark IX is bought by private individuals from importers. There is a small supply of mark IX in store, but it is only issued on repayment.

These cartridges, and many other of the stores used, might advantageously be made in this country at a saving to Government sufficient to nearly double the amount now available from the Militia Grant for such purposes. We ought also to take into serious consideration the probable stoppage soon of the manufacture in England of Snider ammunition, that arm being no longer the weapon of the Army.

Taking the statistics furnished in the yearly Militia Reports by the Director of Stores for the last two years (1875-76), we find that the issue and sale of Snider cartridges, ball and blank, amount to no less than 2,503,184 rounds!!!

In the last year, 1876, the number of rounds sold to the different Rifle Associations and for individual target practice, amount to 511,302, with an issue by Government for Militia practice of 320,973: in all 832,275 rounds, exclusive of course of an immense number of cartridges purchased from importers for private practice, of which no statistics can be obtained.

Looking at the returns of the last three years, it will be seen that the sale of ammunition to the Rifle Associations, corps, and private individuals for practice, was as follows:—

1874 .....	142,040 rounds.
1875 .....	231,870     "
1876 .....	511,302     "

Doubling every year! Surely this is most gratifying, as showing the great and increasing interest taken by all ranks of the Dominion Militia in perfecting themselves in the use of their weapons. Much of this good effect is doubtless due to the encouragement given by the various Rifle Associations, and notably by the "Dominion of Canada Rifle Association," under the presidency of Lt.-Col. C. I. Gzowski, whose exertions for and liberality towards Canadian marksmen can scarcely be over-estimated.



In 1875 and 1876, 36,261 lbs.<sup>1</sup> of gunpowder and 22,000 friction tubes, with the usual proportion of shot, shell, fuzes, &c., were expended for field and garrison artillery in practice.

The Dominion Artillery Association, lately organized by Lt.-Col. Strange, R.A., Dominion Inspector of Artillery, is having the same good effect in fostering gun practice; though it is only right to say that it cannot be expected to develop in the same way the expenditure of artillery ammunition until the subscriptions to this Association are largely augmented, as private practice with this arm can rarely be carried on.

The above figures show conclusively the large and rapidly increasing expenditure of material controlled by the Dominion Government. Let us hear what Lt.-Col. Robertson Ross, formerly Adj.-General of Militia, has had to say on the subject of these stores being manufactured in Canada. His remarks on this subject are embodied in his report on the state of the Militia, and date back as far as 1872.

“Hitherto the supplies of uniform clothing, military equipment, small arms, small arms ammunition, rifled field guns, ammunition for field and garrison artillery, &c., &c., and military stores generally, have been obtained almost entirely from the Imperial Government, or from private contractors in England.

“It appears to me that the time has now arrived when an alteration in this system might be adopted to a very great extent with advantage.

“The desirability of expending in the country, as far as possible, the money voted for the annual supply of these stores is obvious, but I would especially call attention, on military ground, to the necessity for commencing the manufacture of small arm ammunition, and such warlike stores as are annually required for practice, and for the maintenance of a sufficient reserve.

“As regards gunpowder, an article of the first military importance, and which could not be obtained in time from England should a sudden emergency arise, Lt.-Col. French,<sup>1</sup> Inspector of Artillery and Warlike Stores (formerly Inspector of Warlike Stores for the Imperial Government at Quebec, and consequently a competent authority) has reported to me, on this subject, as follows:—

““Having reference to the ammunition required for gun practice for the current year, I have the honour to point out that for various reasons it would be desirable to ascertain if the powder could not be manufactured in the country.

““In December, 1871, I inspected the powder mills near Hamilton, and I feel satisfied from that inspection, as well as from conversation with the manager and foreman, that a suitable powder for heavy guns could be produced at those mills.

““The fine brand of powder known as “Dominion Rifle” is an excellent powder; I have used it a great deal myself, but the fact that it is used in a great measure by small-bore riflemen is sufficient proof of its excellence.

<sup>1</sup> This Officer, while in the Dominion, did much for the Canadian Militia of his own arm.

“ ‘ It is, I suppose, needless for me to mention the advisability of encouraging the manufacture of gunpowder in the country ; at the same time it will be necessary, if Government should contract with manufacturers for this article, to look closely after its manufacture, in order that the conditions may be as similar as possible to the manufacture of the powder at present in store.

“ ‘ I have received from the Superintendent of the Government Powder Factory at Waltham Abbey, England, specifications for the supply of powder by contract, &c., &c. I shall be happy to submit the necessary conditions if required.’

Col. Robertson Ross continues : “ And with regard to the general question of the manufacture and repair of warlike store in this country, that Officer reports to me as follows :—

“ ‘ I have the honour again to bring to your notice the advisability of commencing, even on the smallest possible scale, the manufacture and repair of those warlike stores most needed for the defence of this country.’

“ I would submit for your information the following figures, which will be in themselves a sufficient proof of this fact on the score of economy ; from a defensive point of view, however, the economy is a secondary consideration :—

Imperial Government Prices.	No. 1 Balance Sheet.	No. 2 Balance Sheet.	
	£ s. d.	£ s. d.	
R.L.G. gunpowder, per 100 lbs. . .	2 10 11½	4 7 4½	Vide “ Priced Vocabulary, 1871.”
Snider cartridges, per 1,000 :—			
Ball . . . . .	2 16 10	3 10 3	
Blank . . . . .	1 11 0	1 14 1	

“ No. 1 Balance Sheet is the cost of production, No. 2 is, I presume, a protection to British manufacturers.

“ The Canadian Government have to pay .5 per cent. more than No. 2 Balance Sheet if the articles are purchased in England, or 15 per cent. more if purchased in the Dominion. Thus, the gunpowder would cost the Dominion almost 100 per cent. more than its cost in England.

“ In addition to this 100 per cent., there is the fact that for making up cannon and small arm cartridges, repairing small arms, gun cartridges, &c., there are numbers of public buildings lying idle, the use of these rent free would be almost a set-off to the increased price of labour in this country, particularly if it be borne in mind that the labour of children is employed to a large degree in certain of the minor operations.<sup>1</sup>

“ I would in conclusion submit that the establishment of an arsenal on a small scale may be pressed on the attention of the Government.”

Colonel R. Ross says further : “ With regard to the suggestions of the

<sup>1</sup> In this year of grace, 1877, labour in Canada can be obtained as cheaply as in the mother country.

"Inspector of Artillery and warlike stores, I concur entirely in the views submitted by that Officer."

Reference to the Militia estimates shows that a very considerable sum is voted annually for military stores, &c.; for instance, in the Financial Estimates for the year ending 30th June, 1872, the following sums were voted, viz.:—

	Dol.	c.
"Ammunition .....	139,109	00
"Clothing .....	130,000	00
"Military stores (including storage however)	85,690	00
"Ordnance stores and equipment for field and garrison batteries.....	33,606	00
"For improved fire-arms .....	142,055	00
	<hr/>	
	530,460	00

"Although this amount exceeds the average expenditure, it is evident that a very large sum of money has hitherto (and I believe unavoidably) been expended out of the country, the greater portion of which might now, on military and other grounds, be expended with advantage in the country."

These sound recommendations have been strongly seconded by Lieut.-Colonel Strange, R.A., Dominion Inspector of Artillery, in his report of 1874, and also by Lieut.-Colonel Irwin, Inspector of Artillery.

The logic of such figures as the above seems undeniable, and it is only to be wondered at that our rulers, so keen in reducing the estimates, should not as yet have seen fit to take up the question.

Why should we not have an establishment started for the manufacture of *munitions de guerre*, when, besides other considerations, such an obvious saving can be made?

There would, of course, be a certain outlay necessary in the purchase of "plant;" but the difference in price between Balance Sheet No. 1 and Balance Sheet No. 2 is so great that it is only fair to suppose that the saving to the country in the first year alone would amply cover such expense.

No General would like to have to fight in a theatre of operations more than 3,000 miles from the base of supply; and the problem is not improved by the base in question being nearly inaccessible during about five months in the year.

The reserve of both artillery-material and small arm ammunition is so small<sup>1</sup> that, in the event of hostile attack, large supplies would be

<sup>1</sup> In his report for 1876, the Major-General commanding says: "Our reserve of rifle ammunition is particularly small; we have only 150 rounds for each stand of rifles in the country. This is, at least, one-half too little, keeping in view the rapidity with which breech-loading arms can be fired. In the item of powder, too, our reserve is too small for garrison or field artillery in time of necessity. In 1875 the general reserve in store throughout the Dominion was only—

"Gunpowder.....	188,576 lbs.
"S.A. ammunition .....	6,902,163 rounds.
"Snider rifles, long and short.....	19,820
"Camp equipment for about .....	50,000 men."



wanted from the mother country. At such a time she would be driving her magnificent factories of war material at high pressure for her own needs, and our demands would come at a truly inconvenient season.

Would it not be in our interest in every way to do something in this line for ourselves?

On Government land at Quebec, and surrounded by vacant ground to a safe distance from the dwellings of the city, lies a group of laboratory buildings, built for Imperial uses by the Royal Engineers, and well adapted as workshops for the purpose suggested. They are in perfect order, and a part of them is at present used by the Quebec Gunnery School for making up cartridges, &c., for the Dominion. Large earthen traverses are erected between each building to lessen the effect of an accidental explosion, should such a thing occur.

There is plenty of Government ground for storehouses, and in this place a second-class arsenal, which is what we need, could be easily established.

Here under the guns of the Citadel, and the supervision of a scientific Officer of the Royal Artillery, might be commenced a manufacture, on however small a scale, of material needed and used in Canada.

Artillery Officers superintending the manufacture of material, even on a small scale in such an arsenal, would furnish data as to cost of production which would be useful in checking the prices of contractors on a larger scale. Here, also, all warlike supplies furnished could be tested for acceptance.

The new and delicate means for proof and examination of gunpowder as carried on at Waltham Abbey are given in detail in the "Hand-book of the Manufacture and Proof of Gunpowder, as carried on at the Royal Gunpowder Factory, Waltham Abbey," by Captain F. M. Smith, R.A., Assistant-Superintendent.

Le Boulengé's chronoscope used there in testing the action of the gunpowder when fired has been very fully described by Lieutenant C. Jones, R.A. (a Canadian), in a pamphlet on this subject.

In that ably written book, the "History of the Royal Artillery," by Major F. Duncan, R.A., we read how in the olden time the command of Albert Borgard, 1st Colonel of the Regiment, and a well *foughten* old man he was, contained within itself, with its quaint old staff of engineers, petardiers, matrosses, tinmen (whatever they may be), tentmakers, and artificers of any kind, the skilled artisans necessary for supplying all the wants of an Artillery "Trayne."

Coming down to a later period, the immense Depôt Brigade of Artillery drivers at Woolwich and elsewhere, doing all the carting work previous to the Crimean War, furnished the means of an immediate and great extension to the Artillery.

Gunners also were largely employed in the arsenals and workshops, thereby obtaining a thorough knowledge of the stores they would have to use, and ought to be familiar with.

Turning from great things to small it is admitted that for purposes of instruction many more horses are needed at the two Gunnery Schools, but they cannot be given for economical reasons.



It is said that at one station over 3,000 dollars per annum is paid to contractors for cartage for general militia purposes. This sum would keep 25 or 30 horses more at the school, and an efficient field battery could be maintained, doing all the work and drill besides, without any extra expense to the country.

In such workshops as have been proposed above, the questions of supply, care, and repair meet on a common ground; and the efficient attainment of all these three vital ends would be much fostered by such establishments.

Labour is extremely cheap in Canada, and more especially in Quebec, in the winter months. In the manufacture of fuzes, tubes, cartridges, and small stores of forts, child labour is largely employed.

The following quotations are from the Royal Artillery Institution prize essay of 1872, on the "Establishment and Organization of an "Arsenal," by Lieutenant E. H. H. Collen, R.A., Staff College, Sandhurst. Out of that clever work we will try to choose some portions which bear on our subject. He says:—

"If, then, it may be conceded that the time is fast approaching "when the soldier who aims at distinction must understand and "appreciate every part of the great machine by which an Army is "worked, I may hope to attract to the subject of this essay the "attention of those who would pass it by as not concerning the active duties "of their profession, and as a matter that might well be left to the few "who have made this branch of the Artillery Service the business of "their lives. It requires, however, but little consideration to show "how deeply and intimately is connected the duty of supply with "those military operations which form the chief study of soldiers. "Few of us, indeed, may be actually called upon to organize an "arsenal, but still every Artillery Officer should consider the principles "which should govern the working, while our brother Officers of "other branches of the Service will not find it vain and unprofitable "labour to look into a matter which may be of deep importance to a "General and his Staff, whether in defence of this country or in "foreign expeditions or wars.

"The national scheme of military organization which has been so "lately placed before the public, recognises completely that decen- "tralization in respect to warlike stores, which must accompany an "attempt to form a force of the higher tactical units, each complete "in itself.<sup>1</sup>

"An arsenal is an establishment for the construction, repair, receipt, "storage, and issue of warlike stores.

"Arsenals may be divided into two classes:—

<sup>1</sup> "According to these arrangements, the troops of the reserve would be equipped "for either of the foregoing objects, in respect to arms, accoutrements, clothing, "or expense ammunition from the dépôt centres; the regular and reserve forces "both obtaining camp equipage, field stores, and reserve ammunition from the dis- "trict issuing stores." Report on the organization of the various land military "forces of the country, by a Committee assembled by order of the Secretary of State "for War:—

“First-class Arsenals.

“Second-class       ”

“In first-class arsenals every want of an army and the military service in respect to the munitions of war must be provided for.”

With this class we have not, however, at present to deal, but will consider the subject of a second-class arsenal only.

“ . . . . In an arsenal of the second class, the great manufacturing establishments of the first-class arsenal are compressed into workshops for partial construction and for repair; the store department being of equal magnitude and importance with that of the first-class arsenal. Provision must, however, be made for manufacture to a limited degree, so that by the judicious position and arrangement of our arsenal, we may be prepared to utilize the manufacturing resources of the district in time of pressure or danger.

“With the construction of guns, and the various elaborate processes to which the metal is subjected before being placed in the hands of the artilleryman, a second-class arsenal is hardly concerned, although its workshops must be adapted to perform certain minor operations connected with ordnance.

“While it would be necessary to provide for the chief kinds of ammunition used for field purposes, it would not be possible to have such an establishment as would suffice to manufacture the numerous varieties of ammunition required for siege and naval purposes.

“Again, while the second-class arsenal in peace time would be unable to turn out large batches of carriages, it should be able to make and repair gun-carriages and other carriages used in the field, and form the nucleus of a larger establishment for this purpose. In addition, the second-class arsenal should possess workshops for the repair of small arms, and for the manufacture on a limited scale of harness, saddlery, and accoutrements.”

Here it may be remarked that anyone who had an opportunity of seeing Canada's show of saddlery and harness at the late Centennial Exhibition at Philadelphia, would scarcely doubt our capability of turning out a make of these articles which would contrast favourably with anything to be obtained elsewhere. Further on, the author from whom these quotations are taken continues :—

“Such an arsenal would probably consist of large establishments for storage, with small factories or workshops for repair and replacement, . . . combined with the adaptation of any existing factories to the manufacture of such munitions of war as could be made in the country.”

With regard to the conditions which govern the position of an arsenal, which should invariably be governed by strategical considerations, he adds :—

“An arsenal should be situated at the base of operations, whether for offensive or defensive purposes. Jomini draws a distinction between the base of operations and the base of supply, but this distinction cannot apply to the furnishing and replacement of munitions of war. In defensive operations it must be situated near that point which is the best adapted in all respects to form a last stand-point

“against attack, and from which a successful counterstroke may be launched at the assailant.

“It must be secure from attack, placed at that point from which the transport of stores can be effected with the greatest facility, whether by rail, water, or road—a combination of all these means of transit being the most to be desired—to the various parts of the area to be supplied.

“It should never be too near the frontier or the outer line of defence.

“An arsenal should be placed so that it can, with facility, draw in the resources of the country in minerals, timber, and the great mass of raw material required for the construction of munitions of war.

“Safety and facility for supply and transport are the chief considerations which must decide the position of an arsenal; and whether for offensive or defensive war, it must be protected by such fortifications as shall ensure its defence by a small force against superior numbers, and oblige the latter to undertake its siege or investment with every probability of final failure.

“Provided these conditions are fulfilled,” he continues (and they certainly seem to be, in the case of Quebec, in every particular), “at or near the centre of a manufacturing population would be found the most suitable position for the establishment of an arsenal, for in a position of this kind we might expect to find men, machinery, and material which could in a great emergency be diverted from their ordinary business, and applied to the production of warlike stores, supplementing and expending the smaller organization of peace time.

“In foreign states we look for large arsenals at the great pivots and bases of offensive and defensive operations guarded by fortresses<sup>1</sup> which have grown up with the necessity for the supply and renewal of the manœuvring armies.”

With regard to the administration of such an arsenal, our essayist goes on to say:—

“ . . . . I think few will be inclined to dispute the assertion that the manufacture and supply of warlike stores require special training, and that in addition to the knowledge required of stores in their *passive* state, the officer charged with supply should have a practical knowledge of the *use* of the same. Without this, while it is possible that a department might supply stores with regularity in the time of peace, it would probably fail in the time of war or emergency, because it would not know what stores should take precedence in manufacture or despatch, nor what may be supplied in

<sup>1</sup> “But these should be something more than fortresses—they should contain sufficient material for a great army in artillery fire-arms, provisions of all kinds, workshops, arsenals, hospitals; in fact, collecting all the raw material which naturally flows from the surrounding district into a great city, they should be capable of converting it, by means of a large population of artisans, and of extensive manufactories, into the material of war—of turning brass into cannon, iron into projectiles and rifles, wood into trains of waggons, wheat into biscuit, canvas into tents, &c.”—Hamley’s “Operations of War, 2nd Edition, p. 307.



“ lieu of those of another kind when the stock of the stores required is exhausted.

“ But it may be asserted that it is impossible to obtain a man practically acquainted with, and competent to deal with all natures of stores. This is perfectly true; but an Artillery Officer who knows his profession and the requirements of the other branches of the service, who has passed through the manufacturing courses, will probably be found to best fulfil all the necessities of the case, provided he is assisted by men capable of dealing with the work to be done in a practical fashion.<sup>1</sup>

“ The magazines, although forming an integral part of the administration of an arsenal, would be placed in positions of safety, consistent with facility of supply. The chief points to be attended to are:—

“ (1.) Precautions for safety.

“ (2.) Freedom from damp.

“ (3.) Ventilation.

“ The regulations for the safety of magazines do not need repetition here, as every Officer is expected to know them as contained in the Queen's Regulations.

“ The separation of combustible stores is an important point, *i.e.*, the division of powder, which should be kept by itself, from other stores: tubes, fuzes, cartridges (empty and filled), &c., being kept in a separate magazine. In all magazines very clear arrangement is necessary, and a list of the stores contained should always be placed on the exterior door, the quantity being inserted in a column which may be renewed from time to time by pasting over strips of paper. All cases and barrels should be legibly labelled. . . .

“ In a second-class arsenal. . . . large factories would be replaced by workshops for the performance of minor processes analogous to the larger operations. We should require:—

“ 1. A workshop containing lathes, and all machines for turning, boring, and fitting.

<sup>1</sup> Upon this portion of the subject the recommendation of the two Committees, known respectively as Lord Strathnairn's Committee on Supply and Transport, 1867, and Lord Northbrook's Committee on the Conduct of Business in the Army Departments, 1870, bear very strongly.

The opinion of the former was, as is well known, in favour of a distinct Ordnance Department, and was as follows: “That the custody and management of arms and munitions of war is so special a duty that it could not be conveniently connected with that of other supplies, but that it should be a distinct branch in close connection with the Royal Artillery, who are trained and professionally qualified for such duties.”

Lord Northbrook's Committee, however, considered that this would destroy “unity of administration,” and recommended that the Control Department should consist of two main sections in the War Office and in the field; one for providing and issuing articles required for the daily consumption of an army, such as food, forage, fuel, and light, and for the administration of transport; and the other for the receiving and issuing of all other stores. The latter division should be placed under an Officer who has a professional acquaintance with munitions of war. . . . The education and training which an Artillery Officer receives is precisely that required for an Officer of this division of the Control Department.

. . . . .



- " 2. Smith's shop and forges.
- " 3. (a.) Carpenter's and wheeler's shops, where carriages might be made and repaired; (b.) cooper's shop; (c.) painter's shop.
- " 4. Collar-maker's shop for repair of harness, tents, &c.
- " 5. Laboratory where all the simpler kinds of ammunition might be made up.
- " 6. Armoury workshops with all the lathes and tools for the repair of small arms."

### *Care.*

The care of the heavy ordnance which is mounted and in Artillery charge in Canada is now almost exclusively in the hands of the Gunnery Schools, in which—working under the orders of the Inspectors of Artillery—the Officers, master gunners, with their staff of district gunners, Armstrong armourers, sergeants, &c., keep the armament in a high state of efficiency.

The S.B. cast-iron guns are examined, scraped, and painted regularly, those on land fronts once in two years, and those on sea fronts once a year. Gutta-serena impressions when thought necessary are taken at the bottom of the vent to detect the commencement of cracks round the lower extremity of the copper bushing.

This should always be done after every 200 rounds fired with projectiles.

If found necessary the guns are re-vented, through-vented, or condemned, as the case may require, by the Inspector of Artillery, after examining the impressions taken by the Armstrong armourers.

The 64 32-pr. M.L.R. guns have a space for a shoulder cut in the metal of bore where the bushing enters, and the copper is set up from below into this. With the appliances now available these guns could not be re-vented in Canada.

Owing to the impossibility of furnishing the sentries who used to mount guard during the old *régime*, those guns not in use have their sights removed, preserving screws put in, and their vents stopped with putty.

The latest regulations for the examination of rifled guns are given in a pamphlet containing "Directions for the Preservation of the Sights and Fittings, and for the Examination of Muzzle-Loading Rifled Guns, &c." War Office, August, 1872.

As regards the guns we have in Canada, the 7" B.L.R. and the 64-pr. M.L.R. (converted), should be examined regularly after every 100 rounds with projectiles; smaller guns after every 150 rounds.

On the subject of "care" the Directors say, "It is necessary in order that rifled guns may be always kept in a serviceable condition that the bore of such guns, whether B.L. or M.L., from which practice is carried on, should be kept slightly oiled to prevent rusting. At the close of each day's practice they will accordingly be washed and placed under metal, and as soon as dry will be oiled with a sponge and the muzzles closed with tompons. When guns are not in constant use the bores will be lacquered, and the bright

“ parts about the breech of the B.L.R. guns greased with the following mixture :—

“ Tallow, 3 parts.

“ Lard oil, 1 part.

“ White lead, about 1 lb. to a gallon.

“ The vent-pieces, and all other fittings except the screws, will be removed.”

The M.L. rifled guns are liable to scoring of the bore, an erosive action due to the rush of gas round the projectile, particularly over the seat of the shot, and to cracking of the steel inner tube. The extent of both is ascertained by gutta-percha impressions, and the occurrence of the latter in the 64-pr. and larger natures is indicated by the tell-tale hole, or gas escape.

Our 64 32-pr., being a converted cast-iron gun, is much more dependent on the strength of its tube than a wrought-iron one.

The 9-pr. M.L.R. field guns and fittings should be kept clean and slightly oiled, and require attention from time to time when not in use to prevent rusting. Except during the annual training they are usually looked after by men employed for the purpose by the Commanding Officers of Batteries.

If any of these latter are of the “ spit and polish ” school, they may keep their guns very bright by the use of the following receipt :

A lacquer of—

Rectified Spirits of Wine .....	1 quart.
Dragon's Blood .....	4 drs.
Shellac .....	1½ oz.

Put on with a soft brush ; it requires no rubbing.

For repair of the carriages see “ Notes on the Manufactures of the Royal Carriage Department,” and supplementary chapter on the “ Examination and Repair of Artillery Carriages, &c.,” arranged by Major Oldfield, R.A., Assistant Superintendent Royal Carriage Department, in Griffith's Artillerist Manual, a book that ought to be in the possession of every artilleryman.

Memoranda of examination, or the “ Medical History,” as they are called, of each gun should be carefully kept, and this is regularly done at the Gunnery Schools, as far as the guns in their charge are concerned.

In this record are stated the defects of the gun at the time of its issue, the number of rounds it has fired, and the result of the examinations it has undergone.

The wooden carriages are also looked after and painted and puttied, but there is at present no provision for their repair, which is constantly needed, nor for that of platforms, and both are rapidly decaying everywhere.

It is scarcely necessary to remark how important it is that every Officer in charge of gunpowder magazines should be fully informed in every particular in connection with their care. Full instructions as to the use of the wet and dry bulb thermometer for finding the dew

point, and ascertaining the proper days for ventilation, and many other most important points are given in the "Regulations for Gun-powder Magazines," issued with Army Circular, July, 1874. Every Officer of our Military Store Department, which has sole control of the magazines, doubtless is familiar with these regulations, and has the necessary instruments for enabling him to carry them out. Every fine day is by no means necessarily a suitable one for purposes of ventilation.

Fuzes and tubes can be kept in any safe and dry place. They are not allowed to be stored in a powder magazine on account of containing detonating composition; the same rule applies to small arm cartridges.

The other gun stores and material, such as side arms, tackles, &c., require little care, but much repair and constant renewing.

As for the care and repair of small arms Major-General Sir E. Selby Smyth, K.C.M.G., in his report on the Militia, 1875, writes as follows:—

"My former suggestion, for a permanent Adjutant on the Staff of each battalion,<sup>1</sup> I do not urge, though fully persuaded of the advantage, yet I find the idea not generally accepted, besides being a greater expense than the estimates can at present afford. I still adhere, however, to the proposal for a permanent sergeant-major capable in the highest degree of instructing in drill, discipline, and the duties of guards and sentries, who could also be the care-taker of the armouries and clothing stores.

"The care of arms and clothing is full of difficulties in the peculiar constitution of the Canadian Militia organization. I know they should always, with certain unavoidable exceptions, be kept at the head-quarters of the battalion. When rifle matches occur in rural companies a case of arms could easily be sent for the purpose and afterwards returned.

"The rifles have been in use for so long without examination by an armourer, that I believe I am not exceeding the fact when I say that a large proportion of them are not fit for active service. This is really a very serious state of things—a soldier without his rifle or carbine would be useless. I last year urged the necessity for skilled armourers who should examine every rifle in use once a year, and effect the necessary repairs.

"I again draw serious attention to this most important defect, and earnestly advise that skilled armourers should be imported from the small arms factory. Whether they should go round the various

<sup>1</sup> The appointment of a permanent adjutant and sergeant-major, and one trumpeter for each corps was also a feature in the Militia Bill of Major-General Sir P. L. McDougall, when that distinguished Officer was Adjutant-General of Canadian Militia. This Bill was most eminently suited to our requirements, and was, like its author, very popular with the Canadian Volunteers. Major-General D. Lysons, C.B., Quarter-Master-General, then Col. Lysons, when serving in this country, also drew up a Militia Bill, which contained a suggestion of this nature. The Government of the day lost office by failing to carry this efficient measure, but, well watered, it forms the basis of our present system, which, however, like the original, is weak in proper provision for the artillery arm.



“ battalions and rural companies to repair the rifles on the spot, or whether the rifles should be assembled at certain fixed stations, is a matter of detail easily determined by ascertaining the most economical method. But, pray give us armourers to render these delicate weapons fit for use.”

To these able remarks nothing remains to be added. Arms kept together at the battalion head-quarters, as is the case with city corps, are sufficiently numerous to require the attention of a paid care-taker, and the rifles are properly looked after, as far, at least, as being kept clean is concerned.

In the country, on the other hand, in many cases, the Captains of companies have the care of their own arms, for which duty they receive an allowance of 40 dollars per annum.

They doubtless have the weapons properly cleaned, oiled, and stored away after the training, but if they are not looked at and gone over again *de temps en temps*, before the next year's turn-out, they will be in anything but good condition—even the best Rangoon oil will rust a rifle if left on any length of time, and if they happen to use any other, new rifles would probably have to be furnished before the next training.

There are depôts of material at Toronto, Kingston, Montreal, and Quebec, which ought, however, to be much larger.

The most important stores are those at Montreal and Toronto; both these places are unfortified and perfectly open to hostile attack.

It was at one time proposed to fortify Montreal, or rather to build a line of forts at St. Lamberts on the opposite side of the river, with a keep on St. Helen's Island, guarding the approaches to that magnificent work the Victoria Bridge, but this scheme has since been abandoned. Lt.-Col. Strange, R.A., Dominion Inspector of Artillery, in one of his yearly reports recommends instead to guard the *tête-du-pont* an *enceinte* of Moncrieff pits (armed with guns on Moncrieff carriages), double revetted with timber, and protected from assault by reverse palisaded galleries in the counterscarp of their ditches. This would afford protection to the commercial capital at a minimum of cost.

It would not be advisable to have large armouries in cities when no guard over them of any kind can be maintained. There are splendid corps of Volunteer Militia in each of the above-named places, but should a riotous mob attempt to arm itself by a seizure of Government property, the consequences might be serious.

In the nature of things, a Volunteer corps, however good, takes, unless actually under training at the time, many hours to muster to any considerable strength.

*Chair à canon*, if not exactly artillery material, is at least its *raison d'être*—so this much it may be allowable to say, that these difficulties and many others not coming under the subject of this paper, would be met by the embodying of corps as schools of cavalry and infantry, so strongly recommended by the Major-General commanding; or still better, by increasing the number and strength of the present Schools of Gunnery, and making them schools of all arms.



The present instructional staff would almost suffice with perhaps a slight addition, the great gain would be that the present necessarily employed men would suffice for the whole.

For instance, at each of the Schools of Gunnery there are of necessity guards, cooks, tailors, shoemakers, shoeing-smiths, orderly room clerks, a hospital establishment, mess establishment, provost, and in addition in this country the heavy duties of wood cutting, snow shovelling, &c.

These duties, done by a small isolated corps, would absorb nearly all available men, and render very difficult that instruction which should be the first object of a military school.

At Halifax, Quebec, Kingston, and Ottawa, should be the principal armouries and depôt centres with issuing stores in every military district. The three former cities are fortified posts, and the latter is a long distance from the frontier, and has, moreover, a very efficient militia force, including a fine field battery, a strong brigade of garrison artillery, with a battery of 24-prs. at Nepean Point, and the smart regiment of the Governor-General's Foot Guards.

The supply of British Columbia ought to entail separate arrangements. A depôt of material, and perhaps an arsenal, naval and military, might be established at such a place, for instance, as Penetanguishene.

Everything connected with the supply and equipment of our first line, the Active Militia, ought to be in the most perfect order, and so constituted as to be capable of indefinite extension without confusion, should a sudden strain come upon it. Writing about what would probably occur in the event of anticipated hostilities, Colonel Fletcher, in the lecture before alluded to, says:—

“What would the Government of Canada at once do? First, embody the Active Militia; then complete to war strength the several batteries and regiments of Cavalry, adding guns, troops, and battalions, so as at least to treble the strength of the present Active Militia; bringing up, at the very commencement of hostilities, the number to above 100,000 men.”

We have only 80,000 stand of arms in the country, and of these the General says “*a large proportion of them are not fit for active service.*”

The days of fighting *à l'arme blanche*, are gone for ever among civilized nations.

Our reserve of small arm ammunition ought to be nearer forty than six million rounds, as at present; and there should be camp-equipment for at least the 100,000 men above mentioned.

That such a force would at once spring to arms is beyond question, as has been often proved of yore, and in more recent days at the time of the Mason and Slidell affair, and in 1866, when the frontier farms of Canada were wrecked, and her sons shed their blood in repelling the Fenian hordes.

If supplies for this number of men were on hand and they could take the field at once, sufficient time would be gained for the equipment of the paper army of the reserve, our *undrilled landwehr*.

Those corps now efficient, and there are many very fine ones, should be found in every requisite of a soldier, and be really ready to take the field at short notice in marching order complete in every respect. Probably but few could do this now; perhaps, strictly speaking, none, with the exception of those embodied at the Schools of Gunnery.

One regiment has no valises, another no havresacks; and none have any proper boots and shoes.

As articles of the very first necessity these latter have had honourable mention from Marechal Saxe, Wellington, and many a soldier since.

In this country, the men of our City Volunteer Militia Corps principally wear a boot with elastic sides, a narrow sole, and very high heels; the first day's march would lame half a regiment.

A large reserve of good boots for the mounted services, and strong shoes, something like the ammunition shoe of the British line regiments, might be kept on hand.

Should they show signs of deteriorating from age before being wanted they might be issued free to the force—which does not get too much encouragement at present—and a fresh supply obtained. It is presumed that boots may be treated of under the head of *munitions de guerre*; they are not, at all events, *munitions de bouche*, except perhaps in very extreme cases.

It behoves us in these warlike times to see that our house is in order, and to remember that we are part and parcel of a great Empire, over which the Eastern war-cloud looms rather darkly just now.

That we ought to do something more towards providing for our own defence, considering the protection so generously afforded us by Great Britain, will hardly be denied.

Even putting aside the sentiments of loyalty and patriotism so strong in all classes of the Dominion, and taking the practical and material view, let us remember that our merchant service is the third largest in the world, and, as has been pointed out by a late writer in the *Pall Mall Gazette*, in every sea sails under the ægis of the glorious old flag, and backed by the full power of the Royal Navy of the Mistress of the Seas.

In every port our seamen claim the aid and protection of the British Consul, and all this at no cost to ourselves.

True it is that our neighbours across the line keep up but a little standing army, but their case is not at all analogous to ours in Canada. They maintain a formidable naval force for the protection of their mercantile marine.

We have not a single Canadian ship of war, and rely entirely upon the splendid Navy of the little island which we proudly call our mother country; and yet with all the heavy insurance paid for us so generously by her, we have as yet scarcely shouldered any of the burden of the defence of the Empire.

The Kingston Military College is a step in the right direction; the establishment of a small arsenal of our own would be another.

We do not too greatly centralise our stores of war material, an error

which told so disastrously against the gallant French in the late war—their bravery and desperate valour were fatally handicapped by the want of supplies.

We do centralise, however, in peace time at least, the power of ordering the issue of our military stores. Doubtless this system would be modified in time of danger; but a great military principle is sacrificed—that of practising in peace what will have to be done in war.

The story of the Franco-Prussian War shows plainly a tale of sad disaster consequent upon these questions not being thoroughly worked up and arranged on a proper basis before the commencement of hostilities. France thinking herself ready, and clamouring for war, had her fields bathed in blood, and the two fair provinces of Alsace and Lorraine wrested from her Empire.

One writer says:—<sup>1</sup>

“Bazaine’s first march was a short one and impeded by an enormous quantity of baggage: he gives a further reason for delay in the fact that the French Intendance, or Control Department, had stowed away six millions of cartridges without telling him where to find them, and, moreover, had themselves forgotten their whereabouts. This gave the Germans time; they pushed forward as far as Mars-la-Tour, with cavalry and guns, and struck the head of the French advance, also cavalry apparently without guns. The French prepared to charge, but the German cavalry, who masked their guns, wheeling right and left, opened out and left the guns to work their deadly destiny, and thus turn the tide of French retreat.”

This was no isolated case, and the reasons are not far to seek and are matters of history.

Another author writes:—<sup>2</sup>

“Instead of having, as is the case with Prussia, army corps always in an organized state recruited in the province itself and possessing on the spot their material and complete accessories, the troops of France were dispersed over the whole country, and the material stored in crowded magazines in the most diverse places, so that in the case of a division of the Army being ordered into the field for active service, the artillery had to be ordered from one point, the train equipage and ambulances from another, and the soldiers of the reserve from every point of the compass. To this fundamental defect must be added another of which no military man in France could be ignorant, while so much depended on the intelligence and firmness of individual Officers to bring order out of this chaos, the Officers had no sufficient authority. The most trifling thing, a saucepan, a camp-kettle, a havresack, an extra biscuit, required a Ministerial authorization, an express order from the Office of French Contrôle at Paris.”

The last paragraph describes pretty nearly our system. Surely an Officer entrusted with a high and responsible command might be

<sup>1</sup> Lt.-Col. Strange’s *Retrospect of the last great war.*

<sup>2</sup> Elihu Rich’s *“History of the Franco-German War.”* Vol. I, page 224.



allowed to draw a saucepan or a biscuit. He could always be court-martialled afterwards for any malfeasance.

To quote another :—<sup>1</sup>

“ The Intendance had concentrated all its stores at Rheims without providing in the least for smaller magazines on the lines of march of the troops. There was probably so much hesitation in determining what operation was to be undertaken that the march tableaux were not communicated to the Intendance in proper time.”

The French cry of “*Nous sommes trahis*” was incredible at the outset, but in the light thrown upon the subject by documents that have since been found, it does not seem so very unaccountable.

It is not meant that they were deceived by intent, but rather by the circumstance that a proper system of supply had not been thought out.

That Napoleon dared not trust his Army supplies out of Paris is a theory which may account for much that happened.

Letters from French Generals, found afterwards in the Tuileries, and published by the *Commission des Papiers*, are almost incredible. In the “*Histoire de la Revolution de 1870-71*”,<sup>2</sup> we read :—

“ L’entrée en Campagne, Général de Failly, Commandant 5me Corps à Guerre—Paris.

“ Bitche, le 18 Juillet, 1870.

“ Suis à Bitche avec 17 bataillons d’infanterie. Envoyez-nous argent pour faire vivre troupes, les billets n’ont point cours—Point d’argent dans les caisses publiques des environs.—Point d’argent dans les caisses des corps.

“ DE FAILLY.”

“ *Point d’Argent*,” is a cry not totally unknown in connection with our own military supplies.

A General of Intendance writes :—

“ Metz, le 20 Juillet, 1870.

“ Il n’y a à Metz ni sucre, ni café, ni riz, ni eau-de-vie, ni sel, peu de lard et de biscuit. Envoyez d’urgence au moins un million de rations sur Thionville.”

The General commanding the 4th corps at Thionville says :—

“ Le 4me corps n’a encore ni cantines, ni ambulances, ni voitures d’équipage pour les corps et les états-majors. Tout est complètement dégarni.”

There are many letters in the same strain. One leader alone was not troubled on this score. Général Michel writes :—

“ Suis arrivé à Belfort : pas trouvé ma brigade : pas trouvé général de division : Que dois-je faire ? Sais pas où sont mes régiments.”

Such correspondence shows a state of fearful confusion as regards the supply of the Army, and in the fatal consequences that followed we can see the great importance of the subject.

Doubtless the Germans, so well informed on everything concerning the matter, were not ignorant of this state of French organization, or rather disorganization, and precipitated matters accordingly. History

<sup>1</sup> “The Franco-German War,” by Col. A. Borbstedt and Major F. Dwyer.

<sup>2</sup> Author unknown.



repeats itself; what often happened before occurred in this case and will occur again—not to us let us hope! Germany was ready; France was not, and the latter was attacked and defeated in consequence.

So true still, though so little thought of here, is the saying of the wise old Roman—

*“ Si vis pacem, para bellum.”*

## LECTURE.

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Friday, 21st December, 1877.

Lieut.-General Sir DANIEL LYSONS, K.C.B., Quartermaster-General, in the Chair.

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### THE TELEPHONE AND ITS APPLICATION TO MILITARY AND NAVAL PURPOSES.

By W. H. PREECE, Vice-President Society Telegraph Engineers, and  
Member Institution Civil Engineers.

No one can deny the enormous value of the electric telegraph for war-like purposes. It has well nigh revolutionized the art of war. It has become a great weapon of offence, as well as a great shield of defence. Operations that were a few years ago impossible are now regarded as essential. The strategist in his office can now grasp a continent in his combinations. The actual manœuvres of armies can be controlled and directed like the toy figures of the game of *Kriegs-spiel*. The maintenance of the lines of telegraph to an army in the field is as important as that of the more material lines of communication. The telegraph, in fact, has become a necessity of the age. No war could now be undertaken without its aid.

But it is not only in annihilating space, and bringing within the mental view of the master mind a dozen armies and a million men, that telegraphy is so valuable; it is in the rapid communication of intelligence and orders to and from the Commanding Officers of each limb of each army, however small; it is in connecting together, in immediate communication, the different parts of a fortress or an entrenched camp, however much they may be scattered; it is in maintaining an uninterrupted connection between all parts of a besieging force, however extensive may be the lines of circumvallation, that it is so serviceable. It would have been impossible to have kept on the sieges of Paris and Metz without it. Indeed, it has a civilizing influence, for it not only tends to shorten the duration of war, but to diminish the loss of life, by rendering possible those combinations which, in the cases of Sedan as well as of Metz, swallowed up temporarily in prison two great armies. Moreover, it facilitates the supply of food, it

regulates the traffic on railways, it aids the transport home of the sick and wounded, it satisfies the craving for news, and it alleviates anxiety at home. It is well known that the Germans, guided by their experience of 1866, commenced the war of 1870 with a very well organized and extensive system of telegraphs for field service, but that the French had a system wanting in efficient organization and miserably deficient in men and material. We know little of the present Russian system, excepting the fact that by its aid the army around Plevna maintained its bear-like hug on the doomed fortress, and enabled it to thwart, with overpowering force, the tiger-like rush of Osman Pasha.

So important is efficient telegraphy now considered for the British Army that 6 officers and 160 men are being trained and maintained in efficiency in the British postal telegraph system, so as to be available in time of war. They are, in fact, daily rehearsing that part which they may have some day to perform in earnest in an enemy's country. Moreover, we have our field telegraphs in constant training at Aldershot, Chatham, and elsewhere, though it is very doubtful whether this department has been nearly sufficiently developed, or is anything like being properly equipped, for such an army as ours. However, I am here, not to criticise or describe the equipment of our military telegraphic system, but to describe an apparatus which may prove a most useful and valuable adjunct to the already well matured system of waggons and barrows and cables in actual use. I must draw a distinction between the permanent telegraphic system of the country occupied by an army, the semi-permanent lines of telegraphy which connect head-quarters, as it advances, with this system, and the "flying line" or temporary system of field telegraphs which follows the movements of the various corps in the field, and maintains their communication with head-quarters. The first two must necessarily be worked on the ordinary telegraphic system in use, maintained by technical skilled labour, and worked by well trained, experienced telegraphists. The flying line need not necessarily be so manipulated. There is also the visual system, intended for outpost and reconnoitring duties, and which necessarily must be continued under circumstances which render field telegraphs impractical. I do not intend to refer to this admirable system.

At present, the apparatus in use for field telegraphy is the ordinary Morse recording apparatus, which records its messages in the ordinary dot and dash alphabet, understood only by the initiated, supplemented by a sounding instrument, which appeals, by a similar foreign language, to the ear. Thus, to convey intelligence from one point to another, a message has to be written down on paper, it has then to be translated by a telegrapher into the *Morse* language, which has to be re-translated at the distant end into the ordinary written language, and then read by the recipient. These operations are subject to error, and have not secured faith in their reliability. Is there any Commanding Officer here present who would not wish such an uncertain agent in a very warm place? Those who were present at the Autumn Manœuvres on Salisbury Plain know how to value its services. It is unquestionable

that the telegraph has not inspired confidence, and this is due as much to its natural uncertainty as to the want of knowledge of the tool that is used. Accuracy in the transmission of orders is the *sine quâ non* of a military telegraph. We know of one great disaster that arose from a mistake. "Some one has blundered." It was the very last thing determined upon in our late Ashantee War, and the rapidly collected materials drawn from the Post Office stores were dispatched at the last moment, by passenger train, and stowed in the officers' baggage room. Yet we have the authority of Sir Lintorn Simmons for saying that the operations in that war could not have been carried on as they were without its assistance, and that it was productive of very great economy to this country by shortening the expedition and enabling the greatest amount of benefit to be derived from the materials and means that were placed at the disposal of the General in command.

Now, the telephone, if it prove a practical instrument, will place in the hand of every officer an instrument which will transfer the actual words and tones of his own voice to his correspondent at any reasonable distance. I have spoken distinctly, at various distances up to ninety miles; last week I spoke from Holyhead with my friends in Dublin, through the cable joining those two places, and I have been able to recognise, with absolute certainty, the voices of different people at sixty-seven miles. It will solve the moot question as to the best form of instrument for military telegraphs, about which there is much diversity of opinion.

How is it that the human voice itself can be reproduced at such distances? When I strike a bell, blow a whistle, sound a reed, clap my hands, or speak to you, how is it that these different operations are conveyed through your ears so as to produce on the brain that sensation which is called *sound*? The air itself, in which we breathe and move and have our being, is a highly elastic medium, which readily receives and transmits any motion imparted to it. When I clap my hands, I suddenly throw this air into motion, a wave is formed, just like a stone thrown into water generates a wavn that circles round and round, striking and enveloping everything in its course. This air-wave likewise envelops everything in its course and impinging upon the tympana of your ears, it there affects the nerves in such a way as to convey to the brain that sensation which education has taught us to be that sound due to the clapping of hands. Sound is therefore simply the undulations of the air; but there is sound and sound. I shake this box of nails; it makes a most disagreeable noise. I blow this reed; it makes a soft musical tone. Why have we in the one case *noise* and in the other *music*? In the one case the waves follow each other in irregular spasmodic fashion, shivering the drum of the ear with unpleasant shocks; in the other case the waves follow each other regularly, periodically, and rythmically, blending together on the drum of the ear with pleasant sensations. Let us ignore noise, and confine ourselves to this musical instrument. I blow a note. If it were possible to illuminate a tube of air between the mouth of this instrument and any one of your ears, you would see this air chased and moulded into the most beautiful and regular undulations; not



risers and falls, like the vertical waves of the sea, but condensations and rarefactions—close order and open order—more like a field of barley in autumn time responding to the motion of a gentle breeze. If we conceive a line of particles to be arranged along this tube, like a long file of men or a row of marbles, then if each particle takes an excursion to and fro for the same distance (the same *amplitude*), however small, then if the motion of each particle be successive, and not simultaneous, the line will be excited into waves or sonorous vibrations, as shown in Fig. 1.

FIG. 1.

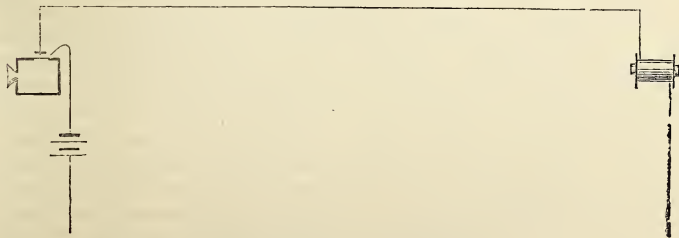


Now, let us fix our attention upon this musical instrument and this suppositious tube of air. I can produce various *notes*. One note differs from another note only in the number of waves or sonorous vibrations produced per second. Middle C of the piano makes 264 of these vibrations, E 330, F 352, A 440, and the octave to C 528 per second. The lowest note that can be heard by the human ear is 16 complete vibrations per second; the highest, 38,000. The range of the human voice is between 65 and 1,044 sonorous vibrations per second. Whenever and however we produce air vibrations, pursuing each other regularly between these two limits, we have *notes*. And one note differs from another note in its *pitch*, which is the number of its sonorous vibrations per second. But these notes may be soft and gentle or rough and loud. Hence notes differ, not only in their *pitch*, but they differ in their *loudness*. Loudness depends upon the energy of the source of sound and upon the amplitude of the consequent vibrations of the particles of air. If I blow gently, the excursion to and fro is small. If I blow fiercely, the excursion to and fro is great. The former undulations strike the ear gently, and the sensation is low; the latter strike it fiercely, and the sensation is loud. Again, I take three or four different instruments and I sound the same note on each with the same force. The pitch is the same, the loudness is the same, but there is no mistaking their difference. This difference is called their quality, clang-tint, or *timbre*. Now, what causes this clang-tint? I must beg your attention here, for here lies the secret of the new articulating telephone. This clang-tint is due to the *form* of the wave of air. It is very difficult to conceive a difference in the form of a wave of air. It is simple enough when we regard water. We see this for ourselves upon the surface of a pond or of the mighty deep. But the difference of an air-wave lies, not in its geometrical form so much as in the rate of motion of its different particles. I wave my hand backwards and forwards regularly or irregularly. I can make it move at any given rate, at any given time, and, though the number of excursions and the amplitude of excursion to and fro per unit of time may be the same, I can vary the form or rate of excursion at will. This produces difference of quality, and this is why

middle C, sounded on a piano, on a harp, on a bugle, or by the voice is the same note, but differing so much in clang-tint. It is impossible to picture in the mind the beauty and minuteness of the sound-waves. The ear, though approached by a channel the diameter of only a quill, will receive the vibrations from a hundred voices and instruments and can separate each by attention. Hence we arrive at our first proposition, that sound is due to the undulations of the air, and that, as these undulations vary in number per second, in amplitude, and in form, so we have noise or music, varying in pitch, in loudness, and in clang-tint.

We have now to consider how we can catch up, as it were, these sounds, and convey them into something else. It is said that Lablache could sound a note so deep and loud that he could crack a tumbler. Whenever anyone sings in a room, something can be always heard to rattle. If you open the piano, and sound the vowels on the middle notes, you will hear the piano repeat them. Hence we learn that the air vibrations can be imparted to other grosser matter in their path. I hold before my mouth this disc of parchment—a small drum-head. It responds to the tones of my voice. I can make this evident to you. It is so constructed that it makes and breaks an electric current every time it vibrates. This electric current operates as an electro-magnet. The electro-magnet actuates an armature. If the motions of this armature are of the same number as the disc, we shall have the note repeated. There you are. Every note I direct upon the disc is repeated by the magnet. But I cannot vary this note. Whether I shout or whether I hum; whether I sound the note upon an instrument or upon a tuning-fork, the note given out by the magnet is the same. It varies only in pitch, and not in loudness or in clang-tint. This is the first telephone ever made, that of Riess of Friedericksorff, and it is illustrated in Fig. 2.

FIG. 2.

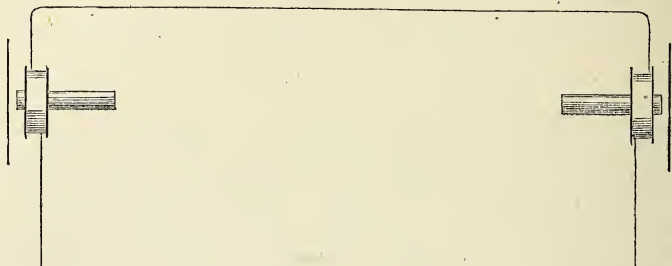


Now I must make a temporary diversion into the realms of electricity.

There are many ways of producing electricity. We have just used a battery where the electricity was produced by the chemical decomposition or combustion of zinc, just as heat is produced by the chemical decomposition or combustion of coal. We can produce it by friction or by heat, but one very common mode is to produce it by the motion of a coil of wire in the neighbourhood of a permanent magnet, or

*vice versa*, by the motion of a magnet near a coil of wire. This is how an ordinary shocking coil is made. Here is a large permanent magnet and here is a coil of wire. I suddenly move that coil of wire, a current is produced, and I have rung a bell. But even if the magnet be fixed and the coil be fixed, any variation in the strength of the magnetism about that coil will produce a current of electricity in that coil. Thus if in front of that magnet which has a coil fixed on its pole, I move this mass of iron, a current will be produced in that

FIG. 3.



coil. And for every motion of that piece of iron I can produce a current of electricity. But more than that, the current will rise and fall in intensity exactly as the iron moves. Hence the currents of electricity produced in that coil will vary exactly as the motion of that mass of iron. Now suppose that mass of iron to be a thin disc like our parchment drum-head, but of iron; and I speak to that disc. We know that that disc will respond to my voice. Whatever words I sound, however I vary them in pitch and loudness and quality, that disc will vibrate in number, amplitude and form, exactly responsive, and currents of electricity will be produced in that coil which will vary exactly in number, strength, and form, with the words I utter. Let this coil be connected with an exactly similar coil at some distance off, and let the currents in the first coil circulate through the second, then if the second coil surround a mass of soft iron, these currents will induce magnetism in the soft iron, and the strength of this magnetism will vary exactly with the currents producing it. If in front of this iron coil we plant an iron disc exactly like the first one, then every time the iron coil is magnetised it will attract the iron disc, and will cause it to move. Now the motions of this disc will vary exactly with the variation of the magnetism of the coil. The magnetism of the coil will vary exactly with the strength of the currents producing it. The strength of the currents will vary exactly with the motions of the first disc, and hence the motions of the second disc will vary exactly with those of the first. In fact they will be an exact reproduction of the first. Hence with whatever note the first disc vibrates, however much it varies in pitch and loudness and quality, the second disc reproduces those vibrations exactly. Those vibrations are imparted to the air and thus we have sounds reproduced

with all the delicate variations of the human voice. The sound of the human voice is transmitted into electric currents, and these currents again produce sonorous vibrations which exactly reproduce the human voice. Indeed, there is no sound which the human lips can produce or the human ear can detect, which cannot be reproduced on the telephone, and where it not for practical difficulties, sounds that "mellow to sadness now madden to crime," could be as easily transmitted from the east to the west as from this hall to the room above. In fact, to "waft a sigh from Indus to the Pole," is removed from the poet's dreamland, and has become as much a matter of fact as "extracting sunbeams from cucumbers."

But not yet—the vapourings of imaginative newspaper correspondents are not yet practical. The articulating telephone itself is an extremely delicate apparatus. It is subject to interference by every waif and stray current that wanders into a telegraph wire, and their name is legion. Atmospheric electricity; earth currents and the influence of neighbouring wires, all generate these troublesome wanderers and interfere with its action. So that on existing lines of telegraph, except for short distances, it has not yet been found useful or even practical, but on short independent isolated lines like those used for field telegraphs, it is a thorough practical instrument, and well deserving the fullest trial that actual service can give it.

It works to perfection in mines. There it is not only free from all extraneous troubles, but the silence of the grave facilitates the operation of its "still small voice." It is not even necessary in such places to put it to the ear. Wherever, however, extraneous sounds intervene not only is it necessary to put it close to the ear, but to effectively shut out all disturbing elements, two telephones are used, one to each ear. A bi-aural stethoscope applied to it is also found an useful adjunct. By its means reading is very simple. How far it could be heard amidst the roar of artillery and the din of battle remains to be tried.

What it does is this: it transmits to a distance far beyond the reach of the ear, or of the eye, the words of command, the tones of voice, the distinct and unmistakable articulation of the general as well as of the private. Such an apparatus must be valuable for military purposes.

How far it can be utilized for naval purposes remains to be seen. Wherever a wire can extend there can the voice be sent. In communicating between the bridge and the wheel, between the turret and the engine room, between the look-out and the officer of the watch, it ought to be useful. For diving operations it is invaluable. In torpedo operations and range-finding it may prove useful.

But at present it is a mere child. It has startled us all by its novelty, its beauty, and its simplicity. Time alone is required to establish its utility. Probably no instrument that has ever been devised has created more sensation, or has attracted so much attention, and I feel highly honoured in having been allowed to bring before such a distinguished audience the incomparable invention of Alexander Graham Bell.

Major WEATHERHEAD: I should like to ask how it happens that the vibration



continues so much longer in the case of the bell being struck, than it does in the case of the sound of the voice?

Mr. PREECE: The simple reason is, the vibrations of the bell are continuous if they are not rapidly stopped. When I take a whistle, blow it and stop, the sound ceases at once the moment you remove the source of the sound. But in the case of the bell, as in the case of the glass, the vibration continues. If you cause a finger glass to sound, you can see the musical wavelets on the surface of the water, which very prettily show the vibration of the body itself. There is a loss of power in the telephone however at a great distance; as the distance increases it has just the same effect as it would have upon the voice itself, for when a person speaks further and further away, the sounds come gentler and gentler; and in the telephone when you add resistance or increase the length of your line, so the voice seems to come from a greater and greater distance.

Captain MAYNE, R.N.: I should like to ask you how far the voice will go, and whether you have any idea of being able to communicate in this way across the Atlantic?

Mr. PREECE: I am not prepared to say that there is much hope of our talking across the Atlantic, but I think it possible to talk to distances greater than the distance across the Atlantic. The reason we cannot talk across the Atlantic is because there is a peculiar electric effect in submarine cable called induction; it is as though the electricity were absorbed by the gutta-percha, and small currents sent in at one end never arrive at the other. They get rolled up as it were into one, so that on a long submarine cable, instead of getting the finer sounds when the vibrations are rapid, they would all come out as one current, not producing any sound at all. It does not seem at present practicable to apply to a greater distance than 200 miles, but in the present day that man would be a very rash man who would affirm that it is impossible to do anything.

The CHAIRMAN: We must, I think, thank Mr. Preece very much for the interesting and able lecture that he has given us on the Telephone. There are probably few gentlemen who have had greater experience in telegraphy than Mr. Preece, who is a member of that department to which we all owe so much—the Postal Telegraph Department. I think that none will deny the great advantages of the telegraph, and there are few Officers who are not well aware of its great importance in the Army on service. I can hardly speak so much of the Navy, but I dare say that there the telegraph will also be of great use. There is no doubt that in all the cases that have been mentioned by Mr. Preece, it will be most valuable. There is one thing that I think will bear much on its advantages in the Army, viz., that it will do away with a great deal of difficulty in providing a sufficient number of telegraphers on service. Here every man will be as it were a trained telegrapher; a General will be able to speak through the telephone without having received any instruction in telegraphy. It only remains for scientific gentlemen to perfect this instrument, which can only as yet be considered as in its infancy. There lies the great labour, we must try experiments and endeavour to perfect it as soon as we can, and I am quite sure that the result will be to the great advantage of our services. In your name I beg to thank Mr. Preece for his interesting lecture.

NAMES OF MEMBERS who joined the Institution between the 1st January and 31st March, 1878.

LIFE MEMBERS.

Travers, J. A., Capt. York Art. Militia.	Draffen, W. Pitt, Major Westmoreland Militia.
Pochin, Norman, Lieut. 7th Royal Fusiliers.	Tomlinson, E. D., M.D., Surgeon-Major A.M.D.
Poole, M. C., Capt. Madras S. Corps.	Cooper, Wm., Capt. Liverpool Rifle Brigade.
Maule, H. B., Major R.A.	Whitehead, Henry, Lieut. 8th Lanc. Rifle Vols.
Hay, James B., Lieut. R.N.	Gordon, Alexander, Capt. 3rd Middx. Art. Vols.
Smith, Walter W. M., Lieut. R.A.	
Barrett, Lennard, Lieut. R.A.	
A'Court, Charles, Lieut. Rifle Brigade.	
Cowan, Jas. H., Lieut. R.E.	

ANNUAL SUBSCRIBERS.

Rolph, W. M., Capt. 17th Regt.	Heath, W. E., Capt. 39th Middx. Rifle Vols.
Spicer, W. J., Ens. Hon. Art. Company.	Phillpotts, A. T., Lieut.-Gen. R.A.
Gordon, W. L. C., Lieut. R.A.	Egerton, G. Le C., Lieut. R.N.
Montgomery, Sir Robt., G.C.S.I., K.C.B.	Beresford-Peirse, A. de la P., Lieut. 25th Regt.
Ross of Bladensburg, E., Lieut. R.E.	McMinn, F. A., Capt. 2nd Middx. Art. Vols.
Florence, Henry L., Capt. 40th Middx. Rifle Vols.	Lee, Henry, Capt. 3rd Shropshire Rifle Vols.
Dickson, E. T., Lieut. 49th Regt.	Garstang, T. W. H., Capt. 19th Middx. Rifle Vols.
Wavell, L., Major Ben. S. Corps.	Styles, R. Osman, Lieut. 19th Middx. Rifle Vols.
Hudleston, Wilfred, Lieut.-Col. Madras S. Corps.	Freeland, John, Capt. 2nd Surrey Rifle Vols.
Butler, John, Major 3rd Surrey Rifle Vols.	Robinson, W. M., Lieut.-Col. 2nd Surrey Rifle Vols.
O'Brien, E. D. J., Lieut. West Kent Militia.	De Hodgson, D. F., M.D., Surgeon-Major A.M.D.
Crowe, Robt., Capt. h.-p., Unatt.	King, Walter S., Lieut. R.N.
Paton, Geo., M.D., D.-I.-Gen. of Hospitals.	Pitman, William, Capt. R.M.A.
Vallings, A., Capt. Ben. S. Corps.	Masterman, John, Lieut. R.N.
Hirst, T. B., Capt. 34th West York Rifle Vols.	Parkinson, R. H., Lieut. 33rd Regt.
Lawton, F. E. A., Lieut. 34th West York Rifle Vols.	Gladstone, C. E., Lieut. R.N.
Prichard, H. C., Lieut. 2nd Lon. Rifle Vols.	Grey, Harry G., Lieut. R.N.
Tyrwhitt, Philip N., Commander R.N.	Cheyne, W. R., Capt. 4th Middx. Rifle Vols.
Drew, George, Lieut.-Col. 1st Lon. Engineer Vols.	Rolfe, Robt., Capt. 39th Middx. Rifle Vols.
Skene, J. G., Major 77th Regt.	Colomb, Geo. H., Col. R.A., F.S.A.
Jones, E. V., Capt. 28th Middx. Rifle Vols.	Barnett, H. C. B., Lieut.-Col. Madras S. Corps.
Wilkin, W. H., Major 3rd Middx. Art. Vols.	

- Kingscote, Anthony, Lieut. R.N.  
 Torry, H. J. B., Lieut. Royal Lon.  
 Militia.  
 Fitzgerald, C. J. O., Major Madras S.  
 Corps.  
 Philipps, C. E. G., Lieut. Pembroke  
 Yeo. Cav.  
 Lee, Ellis, Capt. 65th Regt.  
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# THE HISTORY OF THE

REIGN OF

LONDON: 1784

## NON-COMMISSIONED OFFICERS IN CONTINENTAL ARMIES.

By JOHN ROSS of Bladensburg, Coldstream Guards.

THE question of obtaining a good class of non-commissioned officer, is one which is occupying the serious attention of most Continental nations. Men for service in the ranks are obtained easily enough, and so as a rule are Officers, but the grade connecting the two is wanting. Governments can indeed afford to be very careful in selecting their Officers; and considering how much of the success in war depends upon them, too much attention can hardly be given to seeing that those on whom commissions are bestowed are in every way worthy of their position. Ambition, the desire to embrace a manly career full of enterprise and popular in society, make many wish to become Officers, but not so non-commissioned officers. Their position has little attached to it to make it attractive; it is subordinate, and the honourable discharge of its duties is rewarded, rather by a bare sense of satisfaction than by any more substantial recompense. After a long service, perhaps spent in night work, in bad climates, or even campaigns, a man often finds himself impoverished, broken in health, and unable to take his place among those neighbours who devoted themselves to walks in civil life.

The presence of a good subordinate class of officials is a necessity for all armies, but it is so now more than ever. Modern Continental armies are not what they used to be; now they are regular depôts for an extended and national war organization, through which large batches of recruits have to pass, and where a continual instruction and drill converts the peasant into a soldier. Tactics also as developed in the last few years have imposed new responsibilities upon the non-commissioned officer; there is a greater necessity for individual action and intelligence than formerly, and in the late Franco-Prussian War there were even cases in which sergeants were temporarily vested—at critical moments—with small commands owing to the death of their Officers. To fulfil these new duties, the good old type as personified abroad in the Prussian corporal of Frederick the Great hardly exists, and is dying out rapidly; and there is a great difficulty to be found in inducing the middle classes of society to embrace a military career, or, at all events, to devote some time beyond the obligatory term in the service of the country. The increase of manufacturing energy and commercial enterprise is the principal cause which keeps away this class, which would be so useful as non-commissioned officers; they

can get high wages and live in affluent circumstances in civil life, why should they then put up with the chequered life of a soldier? In the Rhenish and Westphalian provinces it was found more difficult to retain the services of men quartered there, than in the Eastern districts of the German Empire, and for the same reason; high wages were to be found in the former, but not so readily in the latter. The plan of universal service now adopted abroad has also, in a great measure, increased the difficulty. That plan gives powerful armies and large reserves; soldiers exclusively so by profession are discarded, but the whole male population is trained to arms, and every man must pay a tax in personal service before he is permitted to devote himself to his profession or occupation in life. The short training is sufficient to mould the masses into soldiers, but not so to form good non-commissioned officers; also they are too young and inexperienced, and there is quite enough to do in the regiments, to attend to the recruits which constantly arrive. In former days when *long* service was the rule, those who entered the Army knew that a large portion of their life would be spent under the colours; the smartest of them would naturally seek to gain the top of their profession, and try for the highest pay and best pensions. But not so in compulsory service for *short* periods; there they will get it over as soon as possible, and, burying themselves in their civil pursuits, try and forget all about military life.

If the Government could enlarge its expenses and compete in the labour market, there can be no doubt that it could obtain the services of the best men of the country for non-commissioned officers. But it must be remembered that every nation is oppressed with a load already well nigh insupportable, owing to its bloated armaments. Few could spend anything more, and thus each seeks to solve the question, by other means than that of inflicting an additional and weighty tax upon the people; economy, very rigid economy, is the only basis on which they can act.

One of the chief means of obtaining the necessary quality of men for non-commissioned officers in modern armies, is the creation of special schools or corps of instruction. Germany and Italy, as will be seen, have adopted this plan very largely. The best place very naturally in which to train young men who hope for promotion, is in the ranks. It is there that they learn to appreciate the feelings of the men, and are taught to respect the traditions of their corps, and the customs of the service; it is there that their characters are studied by their superiors, and the degree of advancement they are fit for ascertained; and it is there they gain instruction, experience, and tact, which are all so absolutely necessary. But as there is a difficulty in this, in modern armies—if the men will not re-engage after their obligatory service—a more rapid mode of training has been adopted by these schools. There are, however, some drawbacks to the system; the men who issue from instruction as sergeants are too young, younger often and perhaps inferior in attainments to many of those whom they are placed over. They will always form a different *caste* to the rest of the Army, and have little in common with the rank and

file, of whose prejudices they must necessarily be ignorant. There will, it is true, be a leaven of older and re-engaged sergeants who will give their tone to their juniors, and prevent them from abusing the power which they have got so easily; but this will not compensate for the disadvantages of the system. It must be remembered also that schools for training non-commissioned officers are very costly to the State, and especially so when, as in Germany, it is found necessary to establish a preparatory school. Thus the country pays for the education of men who are to fill quite subordinate posts, during which time they are maintained at the public expense, although they perform no military service.

The best means of securing good non-commissioned officers is to induce them to re-engage. This is mainly done by giving them extra pay during their re-engaged service, and a bounty or pension at the end of a certain time, together with the prospect of a situation in the civil service of the country. It has been found that to ensure a comfortable future to a man is the best means of inducing him to remain on after his first term of service; and a question arises of some importance, whether it is advisable to do this by granting places in railways, telegraphs, post, and other offices. Old soldiers with habits of discipline, order, and regularity, are very likely to discharge their new duties very well, but it is evident if they are the only class in the community who are to get these posts, a very important part of the national wealth is unduly burdened. Although they may be well educated they may not suit the place, and if they get it by right rather than merit, they have not the same reason to try and please their employers. The numerous decrees also issued to secure situations for old soldiers, lead to the belief, indeed, that if an open competition were to be allowed, and the best men only chosen, the non-commissioned officers would not by any means always get them. On the other hand, the inducement held out by the hope of civil employment is not considered sufficient to keep men in the ranks after their obligatory service. According to reports from France, the small number of old non-commissioned officers proposed for civil posts, is held to prove conclusively the mistake in thinking that this means alone will keep them under the colours. There are also some in Germany, where as will be seen this system is most relied upon, who consider that it is unwise, and unduly taxes the civil administration of the country, and they believe that a sum of money should be given instead.

But how is this money to be raised? In Italy a special fund is set apart for the payment of these bounties, and the principle adopted appears to have great advantages. It is based on this:—military duty is obligatory to all, but some do not serve, either they cannot from weakness or other causes, or they enter the ranks as one-year volunteers; these then are taxed, and can be made to pay a fine instead. The money so acquired is devoted to the non-commissioned officers' fund. In Italy, it will be seen, the fines paid by one-year volunteers are applicable to this purpose; also in Austria money is obtained, as will appear, from the interest derived from funds, obtained from those who did not serve the State in personal service; but nowhere



else is the principle even in force at present. In France a few proposals to that effect have been made, but the desire to abolish one-year volunteers and the fear that exemptions may again be obtained by money, will probably prevent them from being even considered. Some such system was in force in Bavaria for a short time before the late war; old non-commissioned officers received a bounty of 800 gulden (£66 13s. 4d.), which was paid out of a fund supplied by the fines (called *wehrgeld*) of those incapable of serving, and which varied from 3 to 100 gulden (5s. to £8 6s. 6d.). This was abolished in 1871, the Germans considering that in some way it might let in the thin edge of the wedge, and end in monetary payments for substitutes.

There are a number of men who, from physical infirmity or other causes, are unable to serve at all; there are also those, who, although liable and able to serve, get off on account of the contingent being strong enough without them; and it would seem but fair that they should pay in purse that which they cannot pay in person. Some men, of course, are afflicted by nature to such an extent, that they are burdens on their families; but there are others who, from slight weakness or even tardy growth, cannot bear the fatigue of a soldier's life, but who can easily earn a livelihood. The former should naturally not be taxed; but the latter by paying no fine, get off at present scot free, and benefit immensely by their contemporaries being in the ranks; because they have the field to themselves and get a three years' start of them. These should be made to pay the *wehrgeld*. It may be objected that for the country to pay annually a sum of money which is not levied at the time by Parliamentary vote, is a principle entirely foreign to our ideas; doubtless it is so, and so ought it also to be in all constitutional nations. But, is not universal and compulsory service, the very essence of a tax raised without the sanction of Parliament? If most have to pay their dues to the State in kind, by giving up the fruit of their labour and the value of their time, why should the remainder come off scot free, and shield themselves from loss behind a constitutional principle already broken? In Germany, as we have said, other reasons have abolished the *wehrgeld*, but these might be got over; of course, care should be taken not to permit able-bodied men to get off their term of service by payment of money, and a system of checks could be arranged for this purpose. The idea of substitutes for military duty for a sum of money is not entirely foreign to the Prussian organization; one-year volunteers is only another form of it. This institution is doubtless a necessary one, but its presence shows that the military laws of even Germany have to bend to circumstances; and it may be, that a judicious application of the *wehrgeld* system could form a fund which is so important for the reward of non-commissioned officers, who have served a certain number of years in the Army. If the *wehrgeld* were established throughout the German Empire, it would be the means, it is calculated, of procuring three to four million *thalers* (£450,000 to £600,000) annually, and this would be ample to supply all necessities.

The *Bulletin de la Réunion des Officiers* has published last year some

remarks from the *Allgemeine Militaire Zeitung*, advocating a military tax in the German Empire, for the benefit of the non-commissioned officers. This is a species of poll-tax to be raised on all young men reaching the age of twenty. The following is the calculation given if it were imposed:—at twenty marks (£1) per head, and with 540,000 contributors, a yearly sum of about 10,500,000 marks are obtained. The German Army has about 48,000 non-commissioned officers, and if a third of this number re-engage and receive 300 marks per annum as extra pay, a little less than 5,000,000 marks are spent. The remainder is then in hand for the relief of those widows or orphans who have lost their relations in war time.

An important part of the question under consideration remains to be examined—promotion from the ranks. France has specially adopted this system, being probably impelled thereto by her republican notions. The *corps* of Officers in that country is recruited, first, from students at military colleges, and, secondly, from non-commissioned officers. The latter formed about one-third of the whole, and rarely attained the lowest grade in their new sphere before the age of thirty. As a rule they were good and efficient non-commissioned officers, but thoroughly unfit in education or in general attainments to form a good body of Officers, for without early training they could not become efficient commanders. These promotions then split up the *corps* of Officers into two distinct classes, and destroyed that union and equality which is so essential. Added to this, however, those who came from the ranks, being unfit for promotion to the higher grades—very few sergeants would make efficient Generals or even Colonels—were passed over by their younger and more intelligent companions from the military colleges, and all the best positions in the Army were filled by these latter. The others then found themselves neglected, and superseded by juniors, who, apparently, were on the same footing as themselves. Nor was this all, for so great an influx of men belonging to the lower and middle classes of society, into the body of Officers, militated against the social position of the whole *corps*; rendering commissions unpopular to those who from birth, antecedents, and education would make the best, the most intelligent, and most devoted leaders of the Army. Such was the organization which broke down so signally in 1870, and such it remains still, with the exception that the self-sacrificing efforts of every one in France will go far to remedy any defect in this system. An attempt has now been made to educate those non-commissioned officers destined for promotion; and this plan has been adopted in Italy, where no sergeant can be raised to the “*epaulettes*,” without going through the school set apart for the purpose; this is also the case for the infantry in France. But to adopt this plan, in order to obtain a *reward* for non-commissioned officers, is a mistake, it being open to precisely the same defects as already related. Again, men who have passed years in an inferior position will often regard their elevation not so much as a starting point to future work and advancement, but as the end of their ambition; their new duties will then be discharged rather with indifference than with zeal. In fact, promotion from the ranks sacrifices the

welfare of the *corps* of Officers, in the hope of benefiting that of the non-commissioned officers—a system which is altogether suicidal.

On examination, however, it will be found that neither does the plan benefit that class which it is meant to reward. Their position is not fixed but transitory and unstable. The general desire is to gain a commission, and those that fail in their object—all cannot succeed—have missed their vocation in life, and are consequently humiliated and weary of their profession; there will then be a large leaven of disappointed non-commissioned officers, certainly no advantage to the service. Some in France consider that either too many or too few commissions are given; it is not the prize of the specially deserving nor the lot of all sergeants; they compare this state of things with that in the French Navy, where promotion from the ranks is unknown. Petty officers of the fleet are said to be far better men and more contented than their equals in the sister service; they have gained a real position in life, in which an honourable career is to be found, and they do not crave after an ambition which most cannot reach, and failing which discourages and incapacitates them from further energy. In fact, “*l’homme préfère être le premier dans une bicoque que le second à Rome.*”

At best, a commission is but a doubtful reward to a man brought up to a different state of society, and the Germans, with more wisdom, have instituted quite a different state of things. The idea of promoting non-commissioned officers for the sake of inducing a good class of men to serve as such, is considered entirely wrong. The *corps* of Officers must not be injured; its rôle is all-important, and to carry it out we must have a carefully-trained and high-spirited class of men, able to direct with judgment and to lead with energy. It is, of course, understood that there can be no objection, nay, it is an advantage, when men show themselves competent to raise themselves from a subordinate position to one of trust and honour; the door can never be irrevocably shut which separates one rank of the Army from another. But men should never be so elevated until they are worthy of it; and to be worthy of it, more, far more, is required than the mere humdrum of respectable service. The rank of an Officer should be a high privilege and a position demanding the most exalted characteristics; this rank cannot be within the reach of any proportion of those that enlist; and to affirm that it is possible to allow a commission to be the reward of every respectable or averagely clever non-commissioned officer, is the same thing as to say that every solicitor’s clerk, who can copy legibly and behave decently, should obtain the highest position in the legal profession. Life is composed of different orders, and each have their duties; a man born to one may perhaps be eminently fitted to another above him, but it is quite another thing to ignore these orders in the world, and to pretend that they do not exist; it degrades the highest honours of a country and brings no satisfaction to the men themselves thus unduly exalted.

In turning now to the regulations in force in some of the military Powers of Europe, it will be seen how each has endeavoured to procure good non-commissioned officers for its Army. Happily in



England the supply of these has not yet become a serious question. But taking into consideration the troubles of other nations, as well as the commercial peculiarities of this country, it is highly probable that if ever we should attempt to convert our people forcibly into armed masses, a great difficulty would be the question of how to procure non-commissioned officers.

### *Germany.*

Non-commissioned officers in Germany are obtained from three sources :

1. From *gefreite* (answering to our lance corporals) and privates, men of good character, who know their duty, who can read, write, and reckon, and who have re-engaged (*capitulaten*). These, besides being practically trained, are taught in the regimental schools during the winter months, three to five times a-week, arithmetic, writing, grammar, elementary geography, and history. An Officer presides over this instruction; the students also do not get off any duty while undergoing the course. In the artillery the non-commissioned officers are principally drawn from this class, and especially from three-years volunteers. Candidates, after a year's service, and after passing a written examination, are appointed *obergefreite* (bombardier); three per battery are afterwards sent to the school of the regiment to undergo a course of instruction, which lasts from 1st October to the end of April, and which includes artillery, mathematics, interior economy, writing, and veterinary science. On terminating this course satisfactorily, the *obergefreite* receives a certificate, which qualifies him for the grade of corporal, and after another year's service, and another written examination, he is appointed as such, as a vacancy occurs. To rise higher, he must undergo a stiffer examination.

2. From men of good conduct who have not yet completed their obligatory term in the ranks, and who do not wish to re-engage. Compulsory service in Germany is very short; nominally three years, it often scarcely exceeds two years and a-half, and in the case of the smartest men who obtain the King's leave (*Königs Urlaub*), and who have passed their drills satisfactorily, it is not more than two years. The number of these latter is about twenty per company annually. It is consequently not easy for the military authorities to form their non-commissioned officers with the yearly contingent, and the cases where privates are promoted, who do not re-engage, are exceptions, only resorted to where men are likely to be of use, and where no others are available, which is sometimes the case in some regiments quartered in uncomfortable places. Out of 29,159 non-commissioned officers of the German Army in 1875, 2,414 belonged to this class.

3. From non-commissioned officers' schools.

Germany was the first to found schools for the education of non-commissioned officers. They grew out of an institution established from philanthropic motives in Potsdam in 1824, for the purpose of bringing up orphans of soldiers to a military career. After four years at the school, the boys were sent to the Instructional battalion, and



attached as a special division; and three years later they joined the army, with the rank of corporal. The General in command of the Guard Corps had superior control over this school, and the subjects taught therein were made to embrace everything necessary to form a good non-commissioned officer; in fact, the boys were destined to serve in that capacity; all attempts made to elevate the institution into a Cadet College for Officers were checked, and finally prevented by a Cabinet Order dated March, 1839. This school having been found of public advantage was increased; in 1831 it was doubled; in 1846 it became three companies strong, and in 1858, four companies, or one battalion. In 1860 a new school was erected at Juliers, copied from that of Potsdam; and in 1864, additions were made to the staff of each. In 1867 a third school was founded at Biebrich; two years later a fourth at Weissenfels; again, in 1871, the Imperial sanction was given to a fifth at Ettlingen, which had already existed for the Baden Army; and lastly, in 1873, a sixth was established at Marienwerder in Saxony. These have, therefore, now become quite a national institution, and in 1872 an Officer, with the rank of Major-General, was appointed to inspect and control them. They are each under the command of a Field Officer, or a Captain of standing, as Commandant, and they muster some 500 students each, together with a staff of Officers and non-commissioned officers. In order to insure a good class of the latter, to instil proper ideas of military discipline into the minds of the students, advantages are given to them in extra pay and increased chances of promotion.

Candidates for admission must be over 17 (14 in Saxony), and under 20; they must have a certificate of good character, and pass a simple examination in reading, writing, and arithmetic (as far as the first four elementary rules). On admittance, they must enter upon an agreement, by which they engage to remain in the Service their legal time (3 years), and besides a term of years, equal to double the period they spend in the school. This period varies from two to three years, according to the capability of the pupil, and counts as military service. Thus the State ensures that each man so educated will remain efficient in the ranks as a non-commissioned officer, for five or six years; latterly, it appears it has been reduced to four years. The instruction given is practical rather than theoretical, and aims at making the aspirant able to teach all that is necessary, as well as to set an example of military smartness—writing, reading, arithmetic, elementary history and geography, German, writing small military reports, sketching, and singing, are also taught. Good characters receive four weeks' holidays per year, their journeys home and back being paid for them.

When fit to pass out of these schools the students are posted to their regiments, their distribution being so arranged that those Corps who have sent non-commissioned officers to the staff of the school shall receive, if possible, three from the school in place of each sent there as instructors; otherwise the ordinary vacancies are filled up, the wish of any one for a particular regiment being taken into consideration as much as possible; thirty of the best go annually to the Guard. If

specially recommended they are made corporals six months before leaving the school; at the end of their term of instruction on joining the ranks all receive the bounty given to re-engaged men.

Last year another step has been taken in the education of non-commissioned officers of the German Army. It has been found that the schools have not altogether succeeded; the Government has called for individual reports on each man obtained from them, and the result appears to be that while they are considered satisfactory in military attainments, their moral characters are very bad. In fact it seems that the class of men required has not yet been got hold of. Good-for-nothing lads, whose parents are glad to get rid of them, present themselves in plenty; and thus, while the schools are full of such characters, the right stamp of men do not apply for admittance. It is very probable that this has prevented a greater development of these schools from being carried out. Another attempt is, however, being made to rectify these defects. It is found that the middle classes place their sons in business at about 15, and that good material is thus lost (the earliest age of admittance in the non-commissioned officers' schools being 17). A preparatory non-commissioned officers' school has therefore just been opened at Weilburg for the purpose of feeding the others, and the class of boys to be so obtained, together with the really good stuff already procured—sons of old non-commissioned officers—will, it is hoped, produce the elements required in the Army.

Candidates for this preparatory school must be over fifteen and under sixteen; they must have an irreproachable conduct, perfect health, know how to write legibly, read print, and understand the first four elementary rules of arithmetic. They must present a written consent of their father or guardian to the step they are taking; and must engage in writing to enter the non-commissioned officers' school on completion of the preparatory course, by which they agree to serve in the ranks four years, *i.e.*, two years for every one in the elementary school. The boys are not soldiers nor under the military code until they enter the non-commissioned officers' school, but they can only get out of their engagement by paying their expenses, which amount to 465 marks (about £23) per year. The course lasts two years, the Government pays for everything, feeding, clothing, lodging, and education; anything of a technically military nature is not taught, but all which tends to invigorate the body, gymnastics, fencing, swimming, &c., is specially attended to. Pupils from this school remain another two years at the higher school, or less if they are fit for it physically and in education; they then enter the ranks as corporals.

There were many applications for admittance into this institution at Weilburg, and many had to be refused, and it is probable if it succeeds that others like it will be established; this year from 100 to 150 boys are admitted, next year it is hoped that the full complement of 250 can be lodged.

These arrangements only secure the services of a man for a short time (four years) with the colours, which is not enough; the sergeants would be too young and inexperienced, and little likely to be of much

benefit to the service. An old and steady element is therefore absolutely required. The Germans, as all other nations, have consequently set a high value upon re-engagements, and have tried to induce men to remain on in the service. These re-engagements are made for one year at a time, with the consent of the Captain of the company, squadron, or battery. By this means a man can leave if he wishes to do so, without being tied to serve for a number of years, while, should his conduct not be considered satisfactory, the Commanding Officer may get rid of him easily. The fear of this will keep a man who has once re-engaged attentive to his duties, because unless he serves a certain number of years, he will not have a right to the advantages which the regulations hold out, and which induced him to embrace a military career. These rewards are principally given by appointments to civil posts, rather than by pensions or bounties; in fact, the Germans wish to make the rank of a non-commissioned officer the necessary stepping-stone to employment in the different civil appointments of the country.

As far back as 1867 it was decreed that non-commissioned officers, after twelve years' service, might obtain civil posts (if fit for it) in the following order: (1) those invalided, preference being given to those who are wounded or decorated, (2) those "half-invalided" or fit for garrison duty only, and (3) those who have retained their health and strength. As long as there are military candidates for these situations, civilians were to be debarred from competition.

In 1873 new advantages were conferred on non-commissioned officers:—

(1.) Their pay was increased, in some instances 30 and even 50 per cent.

(2.) Two new ranks were created, that of *vice-feldwebel*, or a junior sergeant-major, one per company, and usually given to an old sergeant as a reward after fifteen years' service. It has no responsibilities, and the pay is 3 thalers (9s.) a month higher than that of sergeant. The other is a new pay-clerk per battalion, a post of trust which enables a man to rise to Paymaster (*Zahlmeister*).

(3.) Their allowances and barrack comforts were increased, sergeants' messes started, and certain other privileges and considerations were extended to them, amongst others the obligation on the part of the soldier to address them by the title *Herr* (Sir).

Next year other regulations were issued (April, 1874). By these pensions were conferred; which were divided into five classes, viz.:—

		Sergeant-major.	Sergeant.	Corporal.
1st class per month	....	14 thalers ..	12 thalers ..	11 thalers
2nd „ „	....	11 „ ..	9 „ ..	8 „
3rd „ „	....	9 „ ..	7 „ ..	6 „
4th „ „	....	7 „ ..	5 „ ..	4 „
5th „ „	....	5 „ ..	4 „ ..	3 „

Non-commissioned officers are entitled (if not invalided) to a 1st class pension after 36 years' service, 2nd class after 30 years' service, 3rd class after 24 years' service, and 4th class after 18 years' service. The above are not paid if the pensioner ceases to be a German subject, or



if he receives a civil post worth a certain sum. It is considered that a sergeant-major should at least have a salary of 350 thalers (about £52), and a sergeant or corporal 250 thalers (about £37) a year; and if the situation does not amount to this, the difference is made up to him, out of the pension he would have got, had he not had the post. Moreover, pensions are given according to the rank held, only when the man has possessed it for twelve years; otherwise (unless invalided for wounds, &c., received in the country's service) according to the rank immediately inferior to it.

Invalid non-commissioned officers are divided into those that become so from natural causes, and those that are injured on service. If the former, the following are the pensions to be obtained:—

(1.) A 1st class pension after 25 years' service, if unable to live without the assistance of strangers.

(2.) A 2nd class pension after 20 years' service, if unable to earn a livelihood.

(3.) A 3rd class pension after 15 years' service, if nearly incapable of earning a livelihood.

(4.) A 4th class pension after 12 years' service, if partially incapable of earning a livelihood.

(5.) And a 5th class pension after 8 years' service, if able to gain a livelihood.

If the latter, then the following:—

(1.) A 1st class pension is given for any service, long or short, if the man is unable to live without the assistance of strangers.

(2.) A 2nd class pension when incapable of earning a livelihood.

(3.) A 3rd class pension when nearly incapable.

(4.) A 4th class pension when partially incapable.

(5.) A 5th class pension when able to gain a living.

In all these cases certificates to obtain civil posts are given should the man be of a sufficiently good character, and in many of the above certain additions are made for good service.

These additions are given:—

(1.) If entirely invalided in war, 2 thalers per month.

(2.) For each mutilation, loss of a limb, or other serious injury, 6 thalers per month. The total not to exceed 12 thalers (loss of sight is, however, considered as extra, 6 thalers for each eye blinded).

(3.) When completely invalided after 18 years' service.

(4.) To those unable to make any use of their certificates to obtain employments in civil life, owing to injuries received in the service, 3 thalers monthly, in lieu of such certificate.

It may be remarked that the Germans also give facilities to sergeants to marry, provided they place 100 thalers in the Savings Bank of their corps, for which they obtain interest. Quarters are given when it is possible to do so, and a certain sum of money is put by, for the education of their sons. Also a pension to the widow and orphans of those killed in war, or who die afterwards from their wounds.

The employments offered to non-commissioned officers of the necessary qualifications, were at first confined to the State railways, telegraphs, post offices, and everything under the Government; but this arrange-



ment does not seem to have answered its purpose sufficiently well, nor to offer a substantial inducement to men to remain their twelve years in the Army. It is calculated that there were some 34,000 places open to soldiers, but that they were not all filled; the pay attached to many of them was a small and insufficient reward, and thus it was found that the number of re-engagements diminished every year. The regulations of 1874 had the effect of only slightly increasing the number of those who meant to serve for their twelve years, but it augmented by 15 per cent. the quantity of those who remained on for a pension after their 12th year. Now this was not exactly what the Government desired, as civil posts and not pensions or bounties are the rewards it lays out for its non-commissioned officers. Accordingly a project was brought in March, 1877, before the Federal Council, by the Chancellor of the Empire, by which employment in private railways shall by law be given to soldiers having the necessary certificates, and who are at least thirty-five years old, and healthy in body and mind, in preference to others. The project continues, that these military candidates shall not be subjected to severer tests than others in considering their fitness, and if they have to give up their duties through incapacity or infirmity, they shall be entitled to the pension which the railway company gives. Also that no bye-laws or regulations shall be legal if it enacts anything unfavourable to military *employés*; and finally on getting one of these situations, an old non-commissioned officer can exchange his certificate for a 5th class pension according to the military rank he held on quitting the army, unless he is entitled to that pension, or to a higher one for other reasons. It is hoped by this means to get a sufficient number of berths for the requirements of the German Army. It is estimated that 127 non-commissioned officers per corps leave with a certificate every year; adding 60 for the Navy, and 418 for the police (they have certificates after nine years' service), and excluding Bavaria, this makes a total of 2,510, or 3,000 yearly at most, requiring situations. By the project of March, 1877, 77,000 posts are said to be thrown open to the Army, out of which—

1,884	yield	a	yearly	salary	of	1,500	marks	and	upwards
2,473	„	„	„	„	from	1,200	to	1,500	marks
6,172	„	„	„	„	from	900	to	1,200	„
and 18,700	„	„	„	„	of	900	marks.		

Probably a large number are not very valuable, but all companies and societies are obliged to advertise in the *Militair-Wochenblatt* what vacancies they have, so as to allow non-commissioned officers with certificates to see what is in the market, and to apply for anything they consider suitable.

Notwithstanding all that has been done, there has been a great deficiency in old and really efficient non-commissioned officers, and some more legislation may be required. Will the Germans persist in taxing their industrial enterprise, and force a certain class of *employé* upon it, or will they raise a fund as fairly as they can from that portion of the Empire which contributes least to their military establishments, and give bounties to their old servants? Within the last few months,

however, an improvement has been observed, and non-commissioned officers do not appear to be so difficult to keep, as was the case formerly; this is due almost entirely to the depression in trade which at present exists in North Germany. This fact will doubtless enable the Government for the present to withhold any further rewards.

Quite recently a new military grade has been created, called *Feldwebel-Lieutenant*, holding a subordinate position among the Officers of the Landwehr, and ranking between a Cadet and a Lieutenant. These posts are to be filled by old non-commissioned officers, who are in good circumstances and otherwise fit for the position. They rank after Second Lieutenant, and can join their regiments without being balloted for; they are exempt from the courts of honour, and instead of a commission (*Patent*) they receive a warrant (*Bestallung*) according to the custom followed in the cases of the *Feldwebel* of the Guard. Their duties are those of Officers, but their pay is not stated in the Cabinet order by which they were created.

#### *France.*

France can hardly be said to have altogether recovered herself since the war of 1870-71, which upset all her military institutions; she is reconstructing herself gradually, and laws regulating the supply of non-commissioned officers are expected, but not yet passed. Moreover, she is a rich country with a flourishing trade, and improving manufactures, and her difficulties with regard to the question therefore are all the greater. The rules at present in force do not secure their object, for the inducements offered are not sufficient. Formerly, bounties were given to re-engaged men, and this answered tolerably well, but as they have been done away with, good non-commissioned officers are all the more difficult to be got. In 1873 there were in the French Army, exclusive of 82 depôts, 494 battalions; only 571 men, or little more than 1 per battalion re-engaged for 5 years. Such being the case, the French Government is obliged to promote soldiers before they have finished their first term of service, and thus the non-commissioned officers are too young and inexperienced. The law of 10th July, 1874, to take effect the 1st January following, endeavoured to rectify this state of things. It provided that the pay should be increased to the following:—A regimental sergeant-major, infantry, 2'33 francs; in the artillery, 3'25 francs per day; pay-sergeants, infantry, 1'40 francs; artillery, 2'60 francs; a sergeant, 1'10 francs, artillery, 1'35 francs. Re-engaged non-commissioned officers to receive an extra pay of 30 centimes daily, and after 10 years' service an extra 20 centimes. After 15 years' service, or 35 years of age, a pension is obtainable, reckoned according to a particular proportion, in such a manner, that for each year of service and each campaign  $\frac{1}{25}$  of the full pension of 25 years' service is given; provided that the sum of the pension and the pay of a Government situation shall not exceed 1,200 francs. After 12 years' service, four of which must have been spent as a non-commissioned officer, they may receive appointments in the public service, post offices, telegraphs, railways, and public offices. This law

has not answered the expectations of the framers, and still men will not remain in the Army.

The education given to French non-commissioned officers is being improved, but it is not yet on an altogether satisfactory footing. These are trained merely in the regimental schools which exist in every regiment of infantry, cavalry, and artillery, but sufficient time is not given to learn much. These schools are divided into three, viz., those of the 1st, 2nd, and 3rd degree. The school of the 1st degree is quite elementary, it exists in every company, squadron, and battery under the captain; it confines itself to reading, writing, and arithmetic as far as the four rules; the teachers are unpaid, and the instruction is obligatory on all soldiers not acquainted with these subjects. It lasts an hour a day at least; in winter, two hours if possible. The schools of the 2nd degree embrace German, arithmetic, general ideas of geography and of minor operations of war; these are instituted for corporals for promotion, also for sergeants and one-year volunteers. The course lasts one year, but the instruction is only given twice a week, and for  $1\frac{1}{2}$  hours each time. Those of the 3rd degree teach French (composition and dictation), arithmetic, history, geography, elements of plane geometry, reading maps, field fortification. The attendance at the latter is voluntary, it is for non-commissioned officers and one year volunteers; no man can be recommended for the rank of Sub-Lieutenant from the ranks, unless he has passed the 3rd degree school, or proves that he knows as much as he could learn there. In 1875, moreover, an improvement took place, and a school—"Ecole d'essai des enfants de troupe"—was established at Bambouillet, and an attempt made to found an institution for the purpose of training non-commissioned officers, in the manner done in Germany and Italy. Boys on the strength of a corps, and recommended by the General in command, to the number of 600, are admitted; 30 of these must pay, but the remainder are free. Great opposition has been made against opening it to any children except those of soldiers, and this is at present the rule. This experimental school has not proved a failure, and it is probable that not only will it be reckoned soon among the permanent institutions of the country, but that others will also be founded for the same purpose. The "*Ecole d'application de Cavalerie*," at Saumur, also trains some non-commissioned officers, and some of the men to become instructors in the cavalry, artillery, and train, the former as Officers, the latter as sergeants. The course of the first lasts a year, and on passing the final examination they are promoted to a commission at once, or on the first vacancies. The course of the second lasts 18 months, and comprises cavalry regulations, rough riding, veterinary science, military legislation, artillery, fortification, military art, topography, and German; at the end of 6 months, on passing an examination, the student is made a corporal, at the end of another 6 months, one-third on the top of the list are promoted sergeants, the remainder on leaving the school. The school at Saumur is also open to cavalry Officers who go through courses of instruction. Finally there are two schools through which sergeants can be promoted to commissions,



(1) that at Vincennes for the administrative branches of the Army, and (2) that at Bourges (*"Ecole de Sous-Officiers d'infanterie"*). All (with very few exceptions) who wish to rise from the ranks must go through this school; the course lasts one year; the number of students is generally 400, but it must not exceed 450. This school, which affects the commissioned ranks of the French Army rather than the others, is not yet considered by some to be on the best possible footing. There are too many students, and thus all do not get their promotion at once on leaving, but have to wait sometimes two or three years, even when high up on the list. The educational standard is not high enough, and men who have not sufficient general knowledge have been allowed to pass. Candidates with greater qualifications and fewer in number may, perhaps, for the future, be the only ones admitted.

General Rochebouët, for a short time War Minister, has lately (10th December last, to take effect 1st January, 1878) placed the military education of the French Army, comprising all relating to non-commissioned officers, &c., under a new *bureau*. The business of this office is now conducted by an infantry Officer, assisted by two or three Officers and clerks. Some new regulations for non-commissioned officers are expected; but the political events which took place in the country last year have required so much attention in another direction, that nothing has hitherto been done. It appears, however, that General Garnier, who now commands the 8th Army Corps, which a short time ago was under General Ducrot, has been employed by the Government to draw up a project to solve the non-commissioned officers' difficulty. A committee of twenty-two members of Deputies in the late French Chamber was formed to inquire into the subject, and a proposal was also made by a sub-committee and presented by General de Chanal. This latter includes the following points:—

(1.) Restrictions to the one year volunteer system.

Public opinion in France has been very hostile to this method of easing a certain portion of the community of their military services. It is considered to be liable to abuse, and to be another form only of the old state of things, which caused so much harm to the country. Moreover the one-year volunteers form the very class from which the best non-commissioned officers should come, and thus it is the desire of General de Chanal to diminish their number. He would allow those with university degrees still to perform this short service, but those who get the advantage by an examination alone, should be less numerous, and reduced to 2 per cent. only of the previous year's contingent. Thus, instead of 9,500 one-year volunteers, he would allow but 3,000, or 2,500 with a university degree, and 500 admitted by examination.

(2.) Voluntary service might commence at 17 years of age, if the candidate were physically fit.

(3.) The formation of non-commissioned officers' schools in every regiment, or battalion separately administered.

This school should be organized as a company, but in case of mobilization it is to be done away with. Men likely to make good non-commissioned officers are taken, and their promotion depends upon



their aptitude and merit. Every year also the smartest who have attained the rank of sergeant-major may compete for admittance into the Military College to become Officers. This rule is explained by General de Chanal as being necessary, so that all the Officers of the Army shall be of *one* origin (that is from the ranks); but it has been pointed out that he really only insists on two-thirds of the number of the candidates coming from that source.

#### (4.) Civil posts.

The principle enunciated is that having served the obligatory term, nothing is to be expected from the State; but in order to gain the advantages of employment by the civil authority, certain extra service must be performed. Consequently the scheme enacts that all those who desire to get any place whatever paid by the State, must have served the country, by having been an Officer, or by having obtained a degree in the schools of medicine, agriculture, &c., or by having been a non-commissioned officer for four years, or by having been a corporal or soldier three years beyond the obligatory term. There are some exceptions to this rule, probably in favour of those who could not serve in the Army.

#### (5.) High pay and annuities.

Every non-commissioned officer and soldier can re-engage for 2 to 5 years beyond his obligatory term under the colours. He can do so when he has served one year, and thereby he receives an extra daily pay of 10 centimes if a private, and 15 centimes if above that rank. A second term of re-engagement is also allowed with the consent of the Commanding Officer, in which case the extra pay is doubled. Besides, men who are permitted to remain in the service five years after their compulsory term, receive an annuity of 15 fr. the first year, increasing 10fr. each year for the remaining four years of their re-engagement, if corporals and soldiers; and if above that rank 30 fr. first year, increasing 20 fr. These sums are procured from a capital which is granted by the State, but which is not payable to the man until he leaves the Army. A second re-engagement is allowed, and the same advantages as in the former are given. Those who sell their reversion of these sums or discount them, are broken, and thereby lose all right to them. A third re-engagement is also allowed on application to the Minister of War, but with no extra pay or annuity. At the end of 15 years' service according to this plan a man would be entitled to a sum of 2,200 fr. (£88), a non-commissioned officer to 4,400 fr. (£176).

#### (6.) Position of non-commissioned officers.

Facilities for marriage are given. Reduction to the ranks can only be effected by a Ministerial order, or by the General of Brigade in case of corporals.

M. Laisant, a Member of the Chamber of Deputies, also brought forward, in November, 1876, a scheme which was referred to the Committee already mentioned, but there has been no opportunity for discussing it as yet; and accordingly he has again presented it to the present Chamber. He aims at giving non-commissioned officers who have proved their worth, and have remained in the service six years,

a certain real status held by a certificate bestowing upon them a permanent grade—*il recevra une commission en vertu de laquelle il deviendra propriétaire du grade de Sous-Officier. Le grade conféré par le Président de la République constitue l'état de Sous-Officier commissionné*—and this position cannot be forfeited except on account of certain crimes. Next, another rank is created, "*premier sergent*." Again, it is proposed that the pay should be the same in every branch of the Army, and should increase with the service of the soldier. This is rated as follows:—*Adjudants* (battalion sergeant-majors), up to 3 years' service, 2 fr. 30 c. per diem; after 3 years, 2 fr. 45 c.; after 6 years, 2 fr. 60 c.; after 9 years, 2 fr. 80 c.; after 12 years, 3 f.; after 15 years, 3 fr. 30 c.; after 20 years, 3 fr. 60 c. The other ranks in proportion, commencing from the following: (for men under 3 years' service) sergeant-major 1 fr. 40 c., *premier sergent* 1 fr. 15 c., sergeant 1 fr., and increasing nearly in the same manner as the pay of the *adjudant*. After 20 years a pension is obtainable, from 600 to 700 fr. yearly, according to the grade of the man; this pension is increased by 10 fr. for every year's service or campaign after the 20 years. All those who have a certificate of permanent grade (*Sous-Officier commissionné*) have a right to a pension, if they are invalided in the service of the country. After 9 years' service (4 a non-commissioned officer) a soldier can demand a situation in civil life; his application goes in, and he continues his duty until a vacancy occurs; he then tries the post for six months, being still kept on in the Army; should he be found fit for it, and if he consents to undertake it, he is struck off the list of the regiment; if not he returns to his duty. It is also contemplated by M. Laisant's scheme to extend the list of posts for which old soldiers are available, and this should embrace those on the lines of railway (belonging to private companies). Finally, there is a hope expressed that non-commissioned officers shall be made as comfortable as possible, more especially those who have their certificates of permanent grade; they should be able to marry, and a mess (*cercle*) should be established, besides libraries for their convenience and instruction. This project still contemplates promotion from the ranks; it confesses that the rank of Captain is the highest which, as a rule, a non-commissioned officer can attain to; it is proposed that its pay be increased, as it is not sufficiently high to make young men care for the position it offers.

General Berthaut, late Minister of War, also presented a scheme to the Chambers in 1877; and this is the one which the Committee adopted. In this project the legal status of the non-commissioned officer is objected to, because, first, it is a mere ideal advantage without a material equivalent; and because, secondly, it might make non-commissioned officers somewhat too independent of their chiefs. At the same time it is conceded that in the Army Regulations a definite grade of the sort may be granted, but that this should not be done by statute. Non-commissioned officers allowed to re-engage, have a sum paid to their credit, rated at 600 francs for each of the first four years in which they serve as re-engaged men. A sixth of that money, or less, may be paid to them as a bounty when it becomes due; the remainder (or the whole if the bounty is not claimed) is placed in the Funds, and yields its interest

to them. The right to sell out is only given when they quit the service. In case of death with the regiment, the widow or next heir receives the full sum of money which should be in the Funds (viz., 2,400 fr.) For wounds or disease contracted in the public service, the man receives the same amount, and in case of promotion to a commission, or an appointment out of the Army, a proportional part is allowed. A proportional part only is also given to those who have been injured otherwise than is mentioned above; those who are reduced to the ranks have a right only to the money earned at the time they committed the fault, the permission however to sell out of the Funds being only granted on the completion of their four years' re-engagement.

Instead of the provisions as to extra pay and pensions, already quoted from the law of the 10th July, 1874, non-commissioned officers, according to General Berthaut's scheme, are to get an increase of 50 centimes per diem after 9 years' service, and a pension after 12 years' service, whose rate is reckoned for each year and for each campaign, at  $\frac{1}{25}$ th of the full pension due after 25 years in the Army. Civil employments are also to be open to non-commissioned officers; and it is reckoned by General Berthaut that his project will give about 2,000 re-engaged soldiers per year. The Minister would, of course, have the right to reduce this number according to the requirements of the country.

The French military world is naturally devoting much attention to this question (as well as to those plans for the reduction of the compulsory term of service from five to three years, and for the suppression of the one-year volunteers), and many are the opinions put forward. Space would not, however, permit us to repeat these various projects. Suffice it to say, that most tend to the plan of giving a bounty after a certain number of years' service, as the best means of inducing men to re-engage, as giving them the greatest possible facilities for getting work when they leave the Army, and as not interfering with the industry of the land. Few proposals, however, have been put forward as to a special fund for the payment of these bounties, and in this respect the tendency in France is not the same (as will be seen) as in Italy. According to the schemes already mentioned, nothing has been said about this; the money required, being raised in the war budget. One scheme by a general Officer, advocating a special fund, may be perhaps touched upon in conclusion. He considers that during the first term of service, non-commissioned officers should belong to the 2nd class; afterwards (re-engagement for 7 years) to the 1st class; during this latter period they receive extra pay, distinctions in their uniform, and better barrack accommodation. At the end of this re-engagement (12 years' service) they should get an annuity for life of 300 francs. Should they desire to re-engage again, they may do so for another 5 years, and at the end of 17 years' service, receive an annuity of 500 francs for life. If they are promoted to Sub-Lieutenant during the second term of re-engaged service, they still retain the 300 francs pension. This money is to be derived from the fines payable by one-year volunteers.



*Austria.*

In the Austrian Army non-commissioned officers are obtained:—

(1.) By promotion from the rank and file. Intelligent and well-conducted men, those who are likely to be of use, are promoted when vacancies occur, provided they have served the minimum term laid down by regulation. No man may be a corporal until he has been in the ranks six months as private, nor a sergeant (or sergeant-major) until he has served one year. For the training of privates, and for the future instruction of those already promoted, regimental schools have been established, and to these further reference will be made.

(2.) By direct appointment, on passing certain qualifying examinations, after having been a student at one of the military academies of the Empire. These institutions are mainly intended to educate the sons of deserving but poor Officers, and in many cases the pupils are maintained free (or nearly free) of all expense to the parents. Most of those whose military education is paid, must sign an obligation (to be ratified by the parents or guardians), by which they agree to serve a year above the legal term, for each year or part of a year spent at school. Those who are semi-dependent on Government aid, must remain in the ranks half that extra time. Those that pay for their education have also to consent to one year's extra service, if they have been four years or more at the school. The whole period under the colours is, however, in no case to exceed 10 years.

There are three of these schools, viz.:—(1.) The Military Technical School (*Militär Ober-Realschule*), a preparation to the Military Technical Academy, of which more will be said further on. Students have to remain at this *Ober-Realschule* for three years, and in finishing their course they receive a certificate marked "excellent," "good," or "satisfactory." Those in the highest class are sent to the Military Technical Academy as vacancies occur; those in the next category become non-commissioned officers in the artillery; and those in the lowest are made 1st class gunners. There are 450 pupils; and the course includes German, French, Bohemian or Hungarian, surveying, physical sciences, geography, history, artillery, geometry, and drill.

(2.) The Military Academy (*Militär Academie für Neustadt*), with its preparatory school—the Military College. The object here is to furnish a certain number of Officers to the infantry, rifles, and cavalry; there are 380 students; the course lasts four years, and the standard of education is much higher than that already given. Those that pass are appointed Lieutenants, but those who fail enter the Army as non-commissioned officers. (3.) The Military Technical Academy (*Militär Technische Academie*) to which the best pupils of the *Ober-Realschule* are sent. The instruction given is about the same as that in the Military Academy; there are 270 pupils, and the course lasts four years. Those that pass become Lieutenants, those that fail are appointed non-commissioned officers.

The term General is applied to that portion of the regimental schools which are destined to educate non-commissioned officers and men. There are four classes; the 1st class is divided into two



sections, viz. :—(a,) instruction for the ordinary rank and file; (b,) for non-commissioned officers and those of the privates likely to get promotion. The 2nd and 3rd classes include those that are trained for special duties, as pioneers, drivers, hospital orderlies, police, pay-sergeants. The 4th class is for one-year volunteers; this too is divided into two sections, viz. :—(a,) for those who qualify for non-commissioned officers; (b,) for those who wish to become officers of Reserve.

The highest non-commissioned grade is Cadet, which is really an aspirant to the rank of Officer. Men are appointed to this position by the War Minister (all other non-commissioned officers are made by the Commanding Officer), but they must either go through the Cadet schools, or else present themselves at the final examination. The rules and the standard of education in these schools are made more with a view to instruct an Officer than a non-commissioned officer. They bear great resemblance to the Younker schools in Russia.

The period of service in Austria is three years. Re-engagements are made after that term for one year at a time, and these can be renewed with the consent of the Commanding Officer eighteen times, until the man has 21 years' service. Re-engaged men receive extra pay, which, however, does not increase with increase of service; it is paid fortnightly, and amounts to 17 florins<sup>1</sup> for a sergeant-major, 14 florins for a sergeant, and 9 florins 40 kreutzers for a corporal per month. Service with the colours, after the legal term has passed, counts towards that in the Reserve, and afterwards in the Landwehr. Bounties are also paid, and these amount to £6 after the first year, to £12 after two years, to £19 after three years, to £26 after four years, and to £126 after twelve years of re-engaged service. Distinctive badges are, moreover, worn on the arm denoting good service.

The money required to furnish this re-engaged pay was first raised in 1849 by fines payable by volunteers. At that time a very trifling additional sum was given to the men who remained on in the service, but the amount was secured to them for life, and in case of death it was convertible into 30 florins. A little later the *remplaçant* system was introduced, and re-engaged men were paid higher out of the capital thus raised. At the end of their service they received a bounty which varied between 1,000 and 1,500 florins. By skilful management a fund was created, which now forms the principal source whence the extra rewards are given to non-commissioned officers. Towards the end of the year 1857, however, the money so accumulated was used for other purposes, and did not benefit, as was intended, the subordinate portion of the commanding *personnel* of the Austrian Army; in that year 23,000,000 florins were diverted to other State expenses, principally for the manufacture of war material. But in 1860 the first step was taken to settle the income derived into a *permanent* fund; and by this means the money in hand has steadily increased, until the introduction of universal service without exemption prevented it from receiving any more fines. The same military regulation obliged the Government also to reduce their re-engaged pay to

<sup>1</sup> A florin is equal to 60 kreutzers, or to 1s. 8d. in English money.

the amounts stated above. The fund created by the *remplaçant* system of the past, bears a yearly interest now of 1,279,926 florins. In 1877, 6,573 sergeant-majors, 11,361 sergeants, and 17,714 corporals were re-engaged men, and received the extra pay which was attached to that position; in round numbers, the amount of money required to defray this was 1,900,000 florins, leaving a surplus of 620,000 florins, to be obtained elsewhere from the State. It is by no means certain that the fund will remain untouched and available for its original purpose; it has once before been appropriated, and a want in the Treasury (which is now said to be felt) might be conveniently satisfied by it. On the other hand, all military opinion is convinced of the necessity of giving an allowance to re-engaged non-commissioned officers, since Austria has always adopted that system; if, therefore, this special fund is done away with, something else will, in all probability, be established.

Pay in Austria is two-fold: *Löhnung* or actual wages, and *Menage-geld* or that in lieu of rations, and payable every five days in advance. This latter varies according to the market prices of provisions, and it is optional whether the men take the allowance in money or the rations in kind. The *Löhnung* amounts to 15 kreutzers per day for a corporal, 20 kreutzers for a sergeant, and 35 kreutzers for a sergeant-major or a cadet; these latter have an allowance, called *Diensteszulage*, of 8 florins per month, and this is payable whether they re-engage or not. The *Menage-geld* is not intended to cover bread, firing, and lights and tobacco, which are provided otherwise.

In barracks corporals and sergeants live with the men, but sergeant-majors, cadets, and one-year volunteers, have generally separate rooms. Non-commissioned officers are free to take their meals where they like. As to marriage, 4 per cent. of the effective are on the strength of the regiment, and their families amenable to martial law; these have quarters or an allowance; also when sick in hospital, or away on duty in peace, or when away in the field, the family gets the following advantages:—(1) One ration of bread for the wife, and half for each child, per day; (2) The *menage-geld* which the husband was entitled to; and (3) lodgings free. The remainder may get leave from the Commanding Officer to marry, but they have no privileges. Non-commissioned officers used to be allowed to remain out of barracks as long as they liked, without leave, after tattoo; but this permission has been cancelled, because the men were not looked after, and the indulgence was found to be unduly great, giving occasion to irregularities.

Punishments in the Austrian Army are as follows:—Sergeant-majors and Cadets may be (1) reprimanded, by word of mouth, in writing, or in presence of all those of equal rank and those above them; (2) leave may be stopped, or even the offender may be ordered to return to barracks at a specified hour before tattoo, for 30 days; (3) room arrest, or open arrest for 30 days; (4) reduction to the ranks, after having been formally warned (this punishment does not apply to a Cadet). Sergeants and corporals are subject to the same punishments as the men, with the exception that they cannot be awarded black-hole, nor can they be "tied up" for 2 hours; they may, however, be

reduced after formal warning. Strict arrest, to which they are liable, means imprisonment for 30 days, without hard labour; solitary confinement can be extended to 21 days. All these punishments are given without trial, but the most severe of them, *e.g.*, reduction, and the full term of imprisonment, can only be inflicted by the Officer commanding the regiment.

Two corps of the Imperial Royal Guard are recruited from the smartest and best conducted non-commissioned officers of the Army. The Trabanten Body Guard, who reckon 48 soldiers (excluding officers, &c.), and the squadron of Life Guards, 60 in number, get their men from this source. The engagement for these corps are respectively three and four years; afterwards re-engagements from year to year. Candidates must be under 35 years old to enter; but there is no limit to age when they must leave.

Promotion from the ranks, properly so called, can hardly be said to exist in Austria. Many candidates for commissions have to go through the different ranks of the Army, but that is with a view to training the Officer himself, not to reward the non-commissioned officer who has proved himself smart and useful in his subordinate sphere. A non-commissioned officer must be first appointed a Cadet, and go through the necessary examinations; he can then only be promoted, after all the Officers of his future regiment have given their consent to allow him to be admitted among them, as being in every way fitted for his new position. In war time non-commissioned officers, who have distinguished themselves before the enemy, and who have received the consent of the Officers of the regiment, are eligible for promotion to a commission.

In Austria there are no pensions for long service, but old soldiers are enabled to receive civil appointments instead. In 1872 and 1873 laws were passed in Austria and in Hungary on this subject. By these, men who have been on the active list for twelve years, eight of which must be spent as a non-commissioned officer, and who are well conducted, acquire a claim to be granted situations in the public service, railways, steam navigations, or other undertakings, which are guaranteed or licensed by the State. Also, those have the same privileges who have been injured in war time, or in the execution of police duties, and who are therefore unfit for military service, but still qualified to undertake civil employment. Civilian candidates are not allowed to compete, if there is a military applicant requiring the post, who is not manifestly unfit for it. From time to time lists are published, stating the vacancies which occur in the civil administration of the country, also the time within which the application must be made for them. If one of these situations is given away illegally—that is to a man having no military claim, when an army candidate was at hand—the appointment is declared null, and has to be given up, except when it has been held for one year; in which case 100 to 500 florins is paid as a fine to the poor-box of the parish. When a licence is given to any railway or steam boat company for the public traffic, the company, even when not guaranteed by the State, is bound by the above laws. Another appointment, open to old non-commissioned officers, who



have qualified themselves for civilian employment, is that of sergeant-major of Landwehr district. The country is divided into Landwehr company districts, and each has a sergeant-major or *Bezirks Feldwebel*. Failing men of twelve years' service, those of ten years—or belonging to the class which is just entering the Landwehr—may be selected. This appointment is worth 600 florins per annum, and increases by 100 florins at the end of five years' service in the post; by 200 florins at the end of 10 years; and 300 florins after 15 years. Besides this pay, the *Bezirks Feldwebel* receives lodging allowance, only a little inferior to that to which a Sub-Lieutenant is entitled.

The system above described does not seem to answer, and the military authorities in the Empire are by no means exempt from trouble in the matter. Quoting from the *Vedette*, an Austrian newspaper, the *Bulletin de la Réunion des Officiers*, of last November, says, that the dearth in non-commissioned officers has never been greater than in 1877; and that even re-engaged men leave the Army as soon as they can. This difficulty, it should be remembered also, is felt far more in Austria Proper, and in the richer provinces, than in Hungary, Dalmatia, Croatia, Gallicia, &c., where trade and manufactures are not so flourishing. We have not, however, seen any proposals yet for remedying this state of things, and consequently it is impossible to conjecture what will be done, if the regulations now in force fail to attract men, to serve the State in the subordinate portion of the commanding *personnel* of the Army.

#### Russia.

Only a short time ago a sufficient number of old soldiers were always to be found in Russia, from which to draw material for non-commissioned officers. Those that served in the Army were cut off, as it were, from their original homes; they lost their communal rights, and were often obliged to remain with the colours out of sheer necessity. Provision seems to have been made for them; they were not sent away, and hence there was always an abundance of men for promotion, men who looked to the Army alone as their home, and as the scene of their life's career. Thus the very elements necessary for good non-commissioned officers according to the old type, were at hand. In 1867, however, soldiers were permitted to retain their communal rights, and during the last fifteen years Russian industries have greatly increased, so that a peasant can now find work where it was formerly impossible; thus it is that men having completed their term of service, leave the ranks, to enter upon other walks in life. Considering that the term of service was long—15 years—this might not have affected very seriously the *cadre* of non-commissioned officers, had it not been that this also was reduced to five years in the ranks. On account of this change, Russia has also been obliged to regulate the recruitment and the reward of her non-commissioned officers.

There are two classes of non-commissioned officers.

- (1.) Those who are illiterate, or nearly illiterate, from the lowest classes of society; and
- (2.) Those that can pass a certain qualifying examination, and who



are either one-year volunteers or have been drawn into the ranks by lot. (In Russia it should be remembered there is universal conscription without exemption; the War Minister, however, determines the requirements of the yearly contingent, and this is taken by lots, the remainder being drafted into the militia.)

The latter appear to be rather Cadets than non-commissioned officers; they are promoted without vacancies, they have certain privileges, are better kept, and, as a rule, get promoted to commissions. From the former class, non-commissioned officers, properly so called, are taken; as a rule only 8 to 10 per cent. of the recruits are able to read, and thus it is necessary to send all those who are likely to be of use to a military school, and after two years' instruction, on vacancies occurring, they are promoted to the rank of corporal (*Mladshji Unter-Offizier*). Non-commissioned officers in Russia receive their rations, clothing, billets, and barracks accommodation (this latter is not sufficient for the whole Army), but their pay is rather pocket-money than anything else. It is payable three times a year, and amounts to—

	Inf.	Cav.	Art.
For a Sergeant-Major ( <i>Feldwebel</i> )	24 roubles,	24 r.,	36 r., yearly.
Sergeant ( <i>Starshji Unter-Offizier</i> ).	18 „	18 „	24 „ „
Corporal ( <i>Mladshji Unter-Offizier</i> )	4 r. 5 c.,	4 r. 5 c.,	9 „ „

In 1871 certain regulations were made by which non-commissioned officers alone were permitted to re-engage after their obligatory service (five years), and if they did so it was at least to be for one year. Extra pay for a *feldwebel* 42 roubles,<sup>1</sup> sergeant 30 r., and corporal 21 r. per year was given to re-engaged men. In 1874 this extra pay was increased to 84 roubles for a *feldwebel*, and 60 r. for a sergeant per year, the corporal receiving nothing; and other rules were published by which useful soldiers (musicians, clerks, &c.), as well as non-commissioned officers, can be re-engaged at least for one year. They can even return to the ranks from the Reserve, if they have not been more than three years (one year for soldiers) away. Non-commissioned officers during their first five years of re-engagement are entitled to a silver chevron on their left arm, after the completion of this term they can remain on wearing a gold chevron, after ten years they receive a silver medal, on which is inscribed “for zeal,” to be worn on the breast, and after fifteen years a gold and silver medal, likewise having the words “for zeal,” to be hung round the neck. Again, after the first five years of re-engaged service, a man is entitled to a certificate recommending him to a civil employment.

In March, 1877, the last regulations were issued, and by these—

(1.) Men who have completed their first five years of re-engaged service, and having received certificates of recommendation, are to be preferred to all others as candidates for employment in the civil and even military administration of the Empire.

(2.) Non-commissioned officers in the receipt of extra pay can, if they wish to leave, receive a bounty of 250 roubles after ten years'

<sup>1</sup> The silver rouble is worth 3s. 2d. The present rouble is paper, and has diminished very greatly in value; a rouble is equal to 100 copecks.

re-engaged service, and after twenty years a pension of 96 roubles the year, or a bounty of 1,000 roubles paid down. If wounded or mutilated in war or in the service of the country, the lesser bounty is paid after seven years, and the greater (or pension) after fifteen years; these are independent of any annuity which the committee who decides on the claims of the wounded may bestow. In case of death, the widows of the above-mentioned men receive 36 roubles the year.

(3.) Corporals who get no extra pay are entitled to it when promoted, not only from that date, but for all their previous re-engaged service. They also receive the bounties (or pension) as above, provided they have been a year in the rank entitled to extra pay.

(4.) Non-commissioned officers, if they return to the colours from the Reserve, are permitted to count their former re-engaged service; but those who leave after their tenth year and take the bounty (250 roubles) lose all right to the higher reward if they again enter the Army.

By these arrangements a man at about 35 is entitled to a sum of 250 roubles and a chance of an employment in civil life, while if he remains another ten years in the Army he is given a capital of 1,000 roubles, or a small pension of 98 roubles for life, when he is about 45 years old. After five years as non-commissioned officer a man may get leave to marry, in which case quarters are usually given to him, and a small allowance for his children, up to 14 years old for boys and 10 for girls.

Above the sergeant-major (*feldwebel*) there is another rank in the Russian Army which is not commissioned, called *Porte Epée Younker*. Promotion to this grade can only be obtained by passing through a special school. The pay attached to it is 100 roubles a year, and it appears to have certain privileges.

*Younkers*, or those passing the necessary examinations, are eligible to rise from the ranks (we are dealing with the 1st class of non-commissioned officers, viz., those that were enrolled as illiterates) after having completed their period of active service, of which one year must be passed as a non-commissioned officer. These Officers are usually posted to garrison troops, and their new position seems to be far from a happy one as they often give up their commissions, in which case they have a special pay and wear the *Younker* badge in silver. About two per cent. of the Russian Officers come from this source.

The regulations concerning civil posts are not yet fixed, for at the end of those issued in March, 1877, the intention of forming a special commission on the subject was announced. The war in Turkey has, of course, put an end to any such thing being carried out; indeed, it is almost impossible to say what will be the effect of these troubles on the question under consideration. We are informed, however, that in Russia there are about 80,000 posts in the civil administration of the Empire in the gift of the Government, with salaries varying from 85 roubles to 700 roubles per year. No qualification is required (except an elementary education, and a good character for zeal) for those worth 240 roubles. In order to obtain the others with a higher

pay, a good hand, technical knowledge, and quickness in accounts are necessary.

If the war does not shake the stability of the Russian military organization, it remains to be seen how these new rules will answer. Hitherto, re-engagements have been insufficient—only one-half the sergeant-majors, and fourteen per cent. of the sergeants being re-engaged men;—this may be due to the quiet and unaspiring tastes of the Muscovite peasant, who is no longer cut off from his home rights by serving the Czar, and who prefers his unobtrusive poverty to military service. On the other hand, these are the first attempts at securing the future comfort of old soldiers, and as soon as the regulations have had time to work, and time to bestow certain bounties, as well as good salaries upon those who shall become entitled to them, the Russian Army may be supplied with as good material for non-commissioned officers as the country affords.

### *Denmark.*

Denmark, as a military nation, is insignificant when compared with the larger Powers of Europe; her position is, however, of great importance; and, surrounded as she is by far more powerful States, her military system has been organized more with a view to defence than to offence. Out of a population of something under 2,000,000 souls, Denmark's forces on a war footing may be considered at about 45,000 men, of whom 25,000 belong to the line, 10,000 to the reserve, and 10,000 to the augmentation. During peace time, only 9,000 men are retained for military instruction; and, during the winter months, 6,000 of these—chosen by lot among those who have passed through their drills satisfactorily—are sent to their homes, leaving but 3,000 men for garrisons, &c.

The Danish Army is divided into brigades, each composed of two demi-brigades (two battalions). The yearly contingent of recruits is sent alternately to the two battalions forming the demi-brigade, and thus each of the former receives its recruits only every two years. The men join in April for six months, and out of their number, 24 men per battalion are chosen for the corporals' schools, and one-tenth of the remainder for the lance-corporals' schools. For admission into the former, an elementary examination is required in subjects which are taught in the first class national schools. These men are all promoted lance-corporals, and remain at school during the winter until the following April; they are then transferred to the other battalion of the demi-brigades, and instruct the fresh batch of recruits in their preliminary work. Afterwards they return to their old battalion for the period of training under canvas, and then, if considered fit, they are promoted to the rank of corporal by the battalion commander; they may be then sent home on furlough, or kept on duty, according to the requirements of the Service. In each cavalry regiment 6 young men are selected for the corporals' school, 8 for the lance-corporals' school. In the Artillery, 87 gunners and 18 drivers for the former, 44 gunners and 20 drivers for the latter.



There are three divisions in the commanding *personnel* (viz., Officers and non-commissioned officers) of the Danish Army:—

1st. Those in temporary employment, viz., Second Lieutenants, and corporals and lance-corporals.

2nd. Those on permanent duty, viz., Generals, Colonels, Captains, and First Lieutenants, and staff sergeants, sergeant-majors, and sergeants.

3rd. Those on the augmentation, viz., same as in the 2nd division.

On a war footing a battalion must have 36 corporals, but on a peace footing 18 are considered sufficient. Men on promotion to corporals, if kept at duty, are retained for periods of service extending to one year (or sometimes two years, if the first period). Sergeants are appointed by the battalion commander from the grade of corporal, but they must not be over 32 years old; on this promotion, they pass from *temporary employment* to *permanent duty*. Two years as sergeant, at least, is necessary to qualify to become sergeant-major, and another two years to become staff sergeant; the latter of these appointments is made by the Brigadier. Non-commissioned officers are placed into the Augmentation on completion of their line service. Corporals may also sometimes be promoted from their regiments to sergeants on the Staff.

There are several schools established with a view to training non-commissioned officers. The first of these is the Elementary School, in which boys between 14 and 16, who are physically fit, are admitted by examination on the subjects taught in the lower national schools. It contains 120 pupils, divided into three classes, and the students are kept a year in each of these. The school bears some resemblance to the earlier forms of the German non-commissioned officers' school; it is organized into an infantry company, having a Captain as commandant and two Lieutenants, together with six staff and other sergeants (of the three arms of the Service) as instructors; there is also a civilian head master and two civilian assistants. The pupils are lodged, fed, clothed, and educated free; and their instruction comprises elementary knowledge, both technical and general, as well as practical work. On leaving, they enter the Army as privates; and, although designed for non-commissioned officers, they have no title to that rank, unless they are quite qualified for it; they have to go through the same course as the other men, and if they fail to pass the entrance examination for the corporals' school, they have to do duty as common soldiers. Those that pass are, however, held to remain under the colours as non-commissioned officers for two years.

The next educational institution includes the corporals' and lance-corporals' schools; in the infantry they are established in each demi-brigade under a Captain, three Lieutenants of at least two years' service, one staff sergeant, and eight sergeants of the battalion, whose turn it is to form the school that year; all the Second Lieutenants of the other battalion act as instructors. In the cavalry, artillery, and engineers, there is only one school for each. Those who are not sufficiently qualified for the corporals' school become candidates for the lance-corporals' school, but both are combined into one establishment, except in the cavalry, where each regiment has one of the latter. The course of instruction in the infantry lasts  $5\frac{1}{2}$  months, in the cavalry



7½ months, in the artillery 8 months, and in the engineers 7 months; it comprises drill, and all that which is necessary for the proper discharge of a non-commissioned officer's duties. It ends with a final examination, and entitles a pupil to be promoted—if he possesses a satisfactory certificate from his Commanding Officer as to his fitness for duty—when he has completed his service as lance-corporal. Seniority is determined by the result of the final examination. Those that fail are sent home in their lance rank.

There are also sergeants' schools, for the purpose of instructing those who are retained for "permanent duty." These establishments are similar to those just described, and in the cavalry and artillery they are combined with them; the course also lasts about the same time, and the instruction is both practical and theoretical. It does not appear that it is necessary to go through this school in order to qualify for a sergeant's stripes, but preference seems to be given to those who have passed the final examination.

Non-commissioned officers have facilities for being promoted to Commissions. After passing the corporals' school, application is made to the War Minister to go through the lower class of the Officers' school; having passed this course successfully (it lasts thirty weeks), candidates then return to their battalions to undergo a practical test; if found to be satisfactory, they are promoted by the War Minister to the rank of Second Lieutenant, on "temporary employment." They are then either sent on furlough, or retained for a minimum period of one year at a time on duty, in the same way as corporals. For promotion to a commission on "permanent duty," Second Lieutenants must pass the second and third classes of the Officers' school, and obtain from their Commanding Officers a certificate of being qualified for the rank. This is the first step in the real commissioned ranks of the active army; and if a volunteer commences his career at the earliest possible age, viz., 18 years old—the compulsory age being 22—and gets on as rapidly as possible through the different schools of military instruction, he will be a First Lieutenant at 23 years of age. The appointment of Officers on "permanent duty" is made by the King; the candidate must be under 32 years old; promotion takes place afterwards by a mixture of selection and seniority, and Officers must have been at least a stated time in each grade before they get their next step. After certain ages they are disqualified for advancement. Non-commissioned officers also are given commissions in the Augmentation, and promotion goes from sergeant to Lieutenant, and so on. If a man finishes his service in the Augmentation, he may be re-appointed to it with a step in rank. Appointments, &c., in this portion of the Danish Army are proposed by the Brigadier, but made by the King in the case of Colonels and Captains; by the War Minister in the case of Lieutenants, and by the Brigadier for non-commissioned officers.

The Officers' school, through which it is necessary for a man to go in order to be promoted, is divided into four classes. The object of the lowest is to train non-commissioned officers to become Second Lieutenants. It contains 63 pupils for the infantry, 19 for the cavalry, 12 for the artillery, and 3 for the engineers. The course lasts from 30th

September till the following 25th April, and includes Danish language, mathematics, strategy and tactics, drawing, artillery, fortification, reconnaissance, and drill. The 2nd class is a preparation for the 3rd, the final examination of the former being the entrance to the latter. The instruction in the 2nd class is purely theoretical, and it is possible for candidates to miss it, by passing direct into the next class. It appears, therefore, that it is established merely as a means of facilitating uneducated men to qualify themselves in the higher knowledge required for the rank of an Officer on "permanent duty." The instruction in the 3rd class embraces military subjects, and the course lasts one year in the 2nd class, two years in the 3rd class. The 4th or senior class of the Officers' school is for the Staff.

Non-commissioned officers are entitled to pensions after having completed an active service of 20 years; this pension increases with the man's service until he has been with the colours 40 years. It also varies with the rank of the individual, who, to get the allowance of his grade, must have served three years in it. The pension of the senior non-commissioned officer (staff-sergeant) after 20 years is £15 11s. 3d. per annum; after 40 years it is £33 7s. 9d. That of a sergeant-major is £11 for the shorter term, and rises to £25 11s. 3d. for the longer; sergeant, £8 18s. 4d. and £20 3s.; corporal, £7 15s. 6d. and £16 13s. 10d.; lance-corporal, £6 14s. and £13 6s. 4½d.; and for a private, £5 11s. 3d. and £11 4s. 3d. Officers also receive pensions calculated according to their service; these amount to one-tenth of their pay if under two years' service, but increase gradually to two-thirds of the average rate of their pay (during the five years preceding discharge) if they have 29 years' service and over. In every case a campaign reckons as two years' service.

Invalid pensions are also accorded to the whole Danish Army when the injury has arisen by the performance of military duty; and these allowances may be made permanent or only for a year at a time. In certain cases the invalid, if an Officer, retires on full pay; non-commissioned officers and men receive a sum varying up to £22, according to rank, and according to the nature of the injury, in addition to the ordinary pension if over 20 years' service, or to a smaller allowance if under that period. When illness not due to the Service invalids a man, these sums are diminished; but in special cases they are increased. Widows of Officers and their children, up to 18 years old, are also allowed small pensions when the husband was himself in receipt of, or eligible for, a pension; in the case of non-commissioned officers and men, the widows and children, up to 15 years old, are in all cases allowed a small annual sum.

Non-commissioned officers are enabled to marry, with leave from their Commanding Officers; but they must be 25 years old, be of good conduct, and have sufficient means to support a family. Should a corporal marry on these terms, he is not permitted to rise in his profession, but is compulsorily sent home at the conclusion of his term on duty. In fact, no man on *temporary employment* who marries, is permitted to go upon *permanent duty*.

Second Lieutenants after one year's service as such, are entitled to

posts in the customs, telegraph and post offices, or to be employed as superintendents, &c., in the Royal palaces, &c. Corporals having served two years after passing the corporals' school have the same claim. Permanently posted non-commissioned officers, after 12 years' service, may be employed under town councils as warders, or in the police, &c.

*Sweden.*

In Sweden there are upper and lower schools for the education of non-commissioned officers of the infantry and cavalry. The latter, or preparatory schools, are established regimentally, every battalion sending 10 men for instruction. The course lasts 42 days, and includes reading, writing, arithmetic (including fractions), and drill. The former, or non-commissioned officers' schools, are two in number, viz., one at Fort Karlsborg for infantry, and the other at Stockholm for cavalry. They are divided into three classes; 1st class is to qualify men for the rank of corporal, 2nd class above that rank, and 3rd class (the senior) is to teach those men of any rank who are sufficiently advanced to profit by its instruction. The course lasts 120 days, and includes reading, writing, arithmetic, geometry, art of war, tactics, field fortification, surveying, instruction in elements of military surgery, and drill. Promotion takes place as vacancies occur, after the candidate has received a certificate as having passed successfully the examination of his class, and after his ability has been tested practically at the regimental head-quarters.

Education for the artillery is in the hands of the instructional department of each regiment, and is under the superintendence of a Captain and a Lieutenant. There are two sections; the junior for corporals and non-commissioned officers, the senior for those preparing for the Officers' school. The junior section is divided into three classes; a certificate in the 1st class is necessary for appointment as lance-corporal; one in the 2nd class as corporal or sergeant; and one in the 3rd class as sergeant-major. In every case the men have to pass through a practical course of instruction; and they are not promoted unless they show that they are proficient in this, as well as in their theoretical studies; which comprise reading, writing, arithmetic, artillery, geometry, mechanics, fortification, and drawing. In the engineers a similar plan to that in the artillery is adopted, but instead there are five classes, viz., preparatory class for the rank and file, 1st class, to qualify for the rank of lance-corporal, 2nd class for that of corporal, 3rd class for that of sergeant, and 4th class for that of sergeant-major. Instruction is progressive, beginning in the lowest class with the most elementary subjects, and ending with algebra, geometry, trigonometry, mechanics, fortification, architecture.

Men must have 18 months' service before they can be appointed to the rank of sergeant, except those who have passed the entrance examination into the Cadet College, in which case they can be promoted in 8 months. The instruction in this college is now purely technical, and students are taken from the ranks of the Army; but of course they must have the necessary qualifications to become Officers.



This is the only way in which commissions are obtained in Sweden, for the law is now virtually obsolete which permitted non-commissioned officers of six years' service, two of them as sergeant-major, to be promoted without examination.

Regiments have private chests, out of which Officers and non-commissioned officers are pensioned.

The term of service is six years with the colours and six years in the Landwehr, but the whole Army is not embodied except during the manœuvres.

#### *Norway.*

Non-commissioned officers in Norway are divided into two classes—those definitely, and those temporarily, appointed. Both are recruited from the rank and file, if they are qualified for promotion. Those intended for the 2nd class are educated for their position (corporals or sergeants) by a course of instruction, lasting six or ten weeks, at the dépôt. Those who aspire to the 1st class have to go through a longer period of instruction; they must remain privates six months, then go through the recruits' school, and then they can be appointed corporals. Afterwards they have to go through a two years' course at the non-commissioned officers' school, and are then eligible for the rank of sergeant. There is one of these schools for each arm of the service in Christiania. According to the manner in which he passes out of the highest class, a student is permitted to compete for admission to the senior division of the War (Officers') School; provided he has at least served for one year as sergeant in the Army, is not over 25 years of age, and has received a sound classical education. By the law of May, 1866, the term of service was fixed at 10 years; 5 of them under the colours, 2 in the Reserve, and 3 in the Landwehr. Substitution was allowed, except in the Landwehr, which, however, could only be called out in case of invasion. In 1876 a new law abolished substitution and the Reserve, the periods of service were also fixed at 7 years for the active Army, and 3 years for the Landwehr. The duty is very light, the troops are only embodied 80 days their first year; and afterwards 30 days a year, is all they have to do.

Those who volunteer for 5 years, and who having completed that period are afterwards free, perform the necessary garrison duties, &c. Non-commissioned officers who have served 20 years are entitled to a pension, and those who have served 6 years on garrison duty, or 12 on general duty, have a claim to a civil appointment.

#### *Belgium.*

The Franco-German War in 1870-71 obliged the Belgians to mobilise their forces. Their system, based on that of France, was equally inefficient when it came to be tested practically. Instead of 104,000 men, which were counted upon in 1870, only 72,000 were forthcoming, and out of these 21,000 were *remplaçant*. This was not considered satisfactory, and a mixed commission was appointed to examine into the question of Army reform; but as the panic of war subsided, the



labours of the commission were neglected, and thus, while every Continental nation has re-modelled its military institutions upon the Prussian type, Belgium alone still retains the old form of national defence. The difficulty of change is doubtless due to the commercial enterprise of the people; for those countries who are wedded to industrial pursuits cannot easily be converted into military powers, on account of the high rate of wages. The non-commissioned officers' question in Belgium under the present system is by no means satisfactory, and every day it becomes more serious; indeed, notwithstanding the advantages offered to a young man of good character and moderate talent, it is found very difficult to keep up the standard of those promoted from the ranks, and this is even said to be deteriorating. Under a reformed system, in accordance with modern military ideas, these difficulties would be increased, unless a special plan were adopted to meet them. A complaint which seems generally made against the manner in which non-commissioned officers are lodged, will probably receive attention and be rectified. Old soldiers are not entitled in Belgium to situations in the civil administration of the country after long periods of service, but although this is also recommended by many, it is a question whether such a plan would altogether suit a manufacturing country.

As to the system of military education in Belgium, which has only been perfected in the last few years, there are—

(1.) Regimental schools, often located away from their regiments, in which elementary education is given for one or two years to those likely to become good non-commissioned officers.

(2.) On appointment, they may go through a course of instruction lasting two years, and embracing French, Flemish, arithmetic, algebra (as far as quadratic equations), Euclid, geography, history, field fortification, and drawing. This qualifies for the higher school. If non-commissioned officers do not go through this course, and if they are under 30, they must attend evening classes, to be taught principally elementary geography and history.

(3.) The highest non-commissioned officers' school is that to qualify candidates from the ranks for commissions. This was established in 1871, and the instruction is said to be the minimum required. There is an entrance and a final examination, and men may go up for the latter without going through the whole course.

Promotion from the ranks takes place easily in Belgium, and thus there is sometimes a difficulty in getting active Officers in the higher ranks by *seniority*; moreover, as has been remarked, the standard of Officers thus obtained cannot be maintained high. There are some, therefore, that desire that this manner of rewarding non-commissioned officers should cease.

General Thiébault, in his first triennial report on the military education, laid before the Chambers 3rd June, 1874, says that the higher education in the Army is satisfactory, but "the same cannot be said of the middle and lower establishments; unfortunately, the good material is not to be found there." Recruitment of volunteers, he considers, leaves much to be desired, as far as quantity and quality is

concerned, and most non-commissioned officers leave the Army at the expiration of their engagement, in order to take the advantage of more lucrative employment in civil life. It is then difficult to supply the Army with non-commissioned officers; instead, a large number of indifferent character take their place as such, and men who do not possess the necessary qualifications are all that can be got.

### *Italy.*

Italy is more advanced in the solution of the problem of getting non-commissioned officers than any other Military Power. She has developed a system which, although not very long in force, seems to answer; it requires only a few years to perfect it and to bring it into full operation. Italy, it must be remembered, has probably less difficulties to contend with in this question, than other nations who have adopted obligatory military service; the country has no great manufacturing or commercial industries to render the Army such a source of loss as it is elsewhere. The character of the people is not very enterprising, and although many from necessity leave the country to seek work elsewhere, yet the majority if they can get just sufficient to live at home, prefer to remain there. Indeed, in many parts of Italy work is by no means easy to be got, and this of course renders good positions in the Army more popular than they would be where an active trade competed in the labour markets. Comparatively speaking, then, Italy has little difficulty in solving for herself the question of non-commissioned officers; although the good results arrived at by her present system are not altogether due to this, but also to the rules which have been drawn out.

The Italians divide their non-commissioned officers into two classes, the superior, or those who are sergeants and above that rank, and the inferior, or those who are corporals and do not rise higher. Little trouble is taken about the latter; men out of the ranks considered fit, are promoted to these lower grades, and when their period of service is over they retire, without any claim on the State. The superior class, or *Sott' Uffiziali*, properly so called, are procured and rewarded in a very different manner.

All men who wish for promotion must engage to serve for a term lasting eight years (the time as private or corporal being allowed to count). This is called taking the *ferma permanente*, and it lies at the very foundation of the Italian system; there is absolutely no exception to the rule. Owing to this, the State can always reckon upon the service of a sergeant for about six years at least, and as the period of the *ferma* is not reduced should a man lose his stripes, there is every inducement for him to discharge his duty with vigilance, instead of having to spend a weary eight years as a private under the colours.

Men of good conduct, of sufficiently strong constitution, and well up in their work, may re-engage for three years at a time, the Royal Carabineers four times, the rest of the Army three times, provided they have not passed the age of 40 for the former, and 36 for the latter. The first of these re-engagements takes effect after the end of the eight years' *ferma*, but the Minister of War is empowered to allow

the man to enjoy the extra pay which it brings, after six years' service; provided always that the man agrees to serve his extra three years, after the completion of the eight years' service. This induces re-engagement and secures the presence of a good non-commissioned officer with the colours after his legal term is completed. These re-engagements all have extra pay attached to them.

There are several winter schools in the Italian Army for the instruction of the men and non-commissioned officers; an elementary class for those who cannot read and write, a school for those who aspire to be corporals, in which grammar and arithmetic are taught; and a school for such as aspire to be sergeants, in which grammar, arithmetic, elementary geography, and the reading of maps are taught. A sufficiently good class of sergeant was however hardly to be expected from the ranks; there was not sufficient leisure for training them, and it became necessary to organize schools or battalions (squadrons or batteries) of instruction, specially established for the purpose of educating young men as non-commissioned officers. These were founded in 1872-73-74. Three, viz., those at Maddaloni, Asti, and Senigallia for infantry; one at Pignerol for cavalry; two at Pisa and Caserte for field artillery; one at Genoa for garrison artillery; and two at Pisa and Casale for engineers.

Candidates for these schools must—

- (1.) Know how to read and write.
- (2.) Enlist for 8 years (take the *ferma permanente*).
- (3.) Be over 17 years and not more than 26 years old.
- (4.) Be unmarried or widower without children.
- (5.) Be sufficiently strong and tall.
- (6.) Not have been previously rejected for the Army, or punished therein as a bad character.

They must further be provided with a document giving the consent of their father, mother, or guardian to join the school; certificate of birth, and of good conduct from the civil authorities, or from the military if formerly a soldier. On entry they have the pay and uniform of privates, their eight years' service counting from that instant; after six months, if they deserve it, they are promoted to the rank of corporal with the pay. On completion of a year as corporal, they are promoted to sergeant if they are considered fit, and go to their regiments as such. Those who have been kept back are allowed six more months to qualify themselves to receive the sergeant's stripes; but after these 24 months at school they must join their regiments with whatever rank they have attained to. If afterwards they do not show sufficient capacity, or fail to satisfy their superiors by misconduct, they are never promoted, while they are obliged to complete their full eight years in the ranks.

These schools are organized as battalions, squadrons, and batteries, with a full complement of Officers and non-commissioned officers. The instruction given is both practical and theoretical; the latter includes Italian, arithmetic, elementary geography, reading of maps, interior economy, elementary principles of military hygiene, and military law, together with an easy method of teaching recruits how to read;



the former embraces drill, musketry, gymnastics, fencing, &c. Especial care is taken that the pupils should be able to teach and drill others; for this purpose they are accustomed to use their voices to drill squads, and to go through all the necessary explanations in the Army Regulations. The great object is to train instructors, men who have a thorough knowledge themselves of everything connected with the Service, and who can impart that knowledge to others. As a rule they are quite young, between 17 and 19 years old, and most of them succeed in passing their examinations to become corporals in six months, and sergeants in eighteen months. In consequence they enter their regiments for the first time younger even than those they are called on to command: obligatory service commences at 20. The inconvenience of this has already been remarked upon. In order, however, to prevent the Army being overrun with too many young non-commissioned officers, which the resources of the present system would necessitate for the next few years, the Government has created the rank of corporal-major, given to the best corporals. They are really sergeants, although they have not taken the *ferma permanente*, and are distinguished by red braid on the arm instead of silver stripes.

Besides their ordinary pay, sergeants receive from the date of their promotion, a special extra pay (*caposoldo*) of 150 lire<sup>1</sup> per year. Also during each re-engagement an additional annual sum of another 150 lire. Thus if a non-commissioned officer signifies his intention to re-engage, as we have seen he can do, after six years' service, his extra allowances per year amount to—

At the school.....	Nil.
When promoted sergeant.....	150 lire.
1st re-engagement from beginning of 7th year to end of 11th year .....	300 „
2nd re-engagement from beginning of 12th year to end of 14th year .....	450 „
3rd re-engagement from beginning of 15th year to end of 17th year .....	600 „
4th (if in Royal Carabineers) re-engagement from beginning of 18th year to end of 20th year....	750 „

On leaving the Army he receives coupons on the National Funds, yielding an income equal to  $\frac{2}{3}$ ths of the extra pay enjoyed on account of re-engagements, but not from the special allowance called *caposoldo*, so that on retiring after 11 years' service, this amounts to 120 lire, after 14 years to 240 lire, after 17 years to 360 lire, and after 20 years (for the Royal Carabineers only) to 480 lire per annum; should he take his discharge during the course of one of the above terms of re-engagements, the amount of coupons are calculated only to give him  $\frac{2}{3}$ ths of the re-engaged pay, for the periods he has completed; thus, in leaving before the completion of his 17th year, he is only entitled to an income of 240 lire. Those, however, who are obliged to leave, from any illness caused by the Service, are permitted to count their unfinished period as if completed.

<sup>1</sup> A silver lire is equal to a franc.



By this means pensions cease to become chargeable to the State, and pension offices are therefore dispensed with; moreover, the holders of these incomes can draw them or sell out of the Funds if they wish to raise a small capital for present use, and these advantages are secured them without burdening the War Department with extra business or trouble. Again, if a non-commissioned officer dies when with the colours, his heirs receive coupons giving an income equal to the full amount of his re-engaged extra pay (not *caposoldo*), and if his death was due to the Service, the broken period of re-engagement is calculated as completed.

After 17 years' service (20 in Royal Carabineers) non-commissioned officers may remain on, if still fit for work: they cannot re-engage, or receive additional extra allowances, but they serve on for pensions. After 25 years' service (if 45 years' old) these are fixed at 500 lire per year for sergeant-majors, 415 lire for sergeants; afterwards, each year, or campaign, adds 10 lire to it, until it reaches a maximum of 725 lire for sergeant-majors, and 565 lire for others, which sums can be obtained after 40 years' service.

After 12 years' service non-commissioned officers who take their discharge are helped in obtaining civil posts. These are more especially taken care of by the War Administration, and are eligible to be named as Sub-Lieutenants in the provincial militia. Generals in command of Army Corps are by a ministerial order of December, 1871, told that a portion of their duty is to get those non-commissioned officers who have served faithfully for twelve years, civil employments, not only in the military administration, but in the railways, telegraphs, &c. In February, 1872, the Minister of Public Works also drew attention to the necessity of employing them on the railways. There appears to be no absolute right to a situation, although a Parliamentary Committee wished to make it so; everything, however, is done to facilitate men getting these employments, and from January, 1873, to May, 1874, 1,035 were so employed.

Non-commissioned officers are treated very well and with great consideration; and finally, they cannot lose their rank without being tried by a court-martial (*Commissione di Disciplina*), composed of a Lieut.-Colonel or Major as President, and four members, the finding of which must be confirmed by the Lieut.-General commanding the division.

Re-engaged non-commissioned officers lose the extra pay attached to the actual period they are completing, when condemned by a court-martial constituted as above. They may, however, leave the Service as soon as their eight years is finished. They retain a right to the income due from former periods of re-engagement (if any); except when deserters, or when condemned to prison by criminal procedure, or by sentence of a military court, in which cases their rights are suspended until they have finished the punishment inflicted.

Those non-commissioned officers who retire after their eight years' service pass at once into the territorial army; on mobilization, therefore, there would be none in reserve to call up to fill the 4,000 vacancies which would occur. This deficiency is made good by those one-year volunteers who obtain the grade of Reserve sergeant. Each year

there are about 400 of them, or 3,000 in the nine classes of the mobilised army. There will probably be more in future, for the permission to get transferred from the first to the second class of the contingent is now done away with (since 1st July, 1876), and there should be more one-year volunteers in consequence.

Italian non-commissioned officers are often promoted to the rank of Officers. A school at Modena is established expressly for this purpose, and a certain number of men are selected each year by the Colonels of regiments to go up for the entrance examination; these candidates must have at least eighteen months' service as sergeant with the colours. If they pass, they go to Modena for another eighteen months, and after a second examination obtain a commission as Sub-Lieutenant. By taking advantage of this regulation, a young man may enter a battalion of instruction at 17 years of age, pass into his regiment as sergeant, and after serving as such for a year and a half, qualify himself for the school at Modena at 20, and finally become an Officer at  $21\frac{1}{2}$  years old. The subsequent promotion of these men will not be rapid, as their education cannot naturally be up to the point it should be, and Captain in the Train will probably be the highest rank to which they can attain. The results, however, of this system cannot yet be ascertained, since it has only been begun a short time ago. It is evidently an expensive process for obtaining Officers; the State having to provide the whole education of the candidates, together with their pay and maintenance for four years and a half—the eighteen months in the regiment can hardly reckon as efficient service.

The ordinary pay is provided for by the War Budget, but the special extra pay (*caposoldo*), and re-engaged pay, are met by funds in the military chest. This is managed by a committee, consisting of eight members, who choose their own president; viz., two senators and two deputies, elected by their respective chambers, two financial officers, and two general officers, nominated by the president of the court to which they belong, and by the War Minister respectively. The committee changes with the Government. The funds used to be obtained from two sources (1) from the fines of those who paid to be transferred from the first to the second class of the annual contingent, and (2) of those who served as one-year volunteers. Since 1st July, 1876, no one can exchange military duty for money, and the fines of one year volunteers (viz., 1,600 lire for cavalry, 1,200 lire for infantry) are consequently now the sole source of income. It is calculated that there are annually about 4,000 one-year volunteers, and that 8 per cent. enter the cavalry. Thus

By 320 one-year volunteers for cavalry at 1,600 lire . . . . .	512,000
And 3,680 one-year volunteers for infantry at 12,000 lire.	4,416,000

Or annually . . . . . Lire 4,928,000

According to statistics there are 11,650 non-commissioned officers who receive special extra pay (*caposoldo*), and this at 150 lire each, amounts to 1,747,500 lire, which leaves a sum of 3,180,500 lire every year for

re-engaged pay. Should this source of income not be sufficient, there is still the means open for procuring more, by levying money from those who cannot serve in person—like the old Bavarian *Wehrgeld*.

Such are a few of the leading features of the Italian system for the supply of non-commissioned officers, and it is found to give a sufficient quantity for the requirements of the Army. Of course time is needed to give thorough proof of its value, and certain modifications will probably be necessary in its details. Its broad principles, however, are sufficiently striking and important to make them worth the serious consideration of those countries who are perplexed with the difficulties of the question. These principles seem to be—

(1.) Engagement for eight years for all who take the stripes.

(2.) Inducements for re-engagement, viz., an increasing extra pay, and a bounty on completion of service given in a convenient form to the recipient, and in a manner to lighten the duties of the War Department.

(3.) Recognition of the principle that those who cannot serve in person, when universal conscription without exemption is the law of the land, shall be obliged if necessary to pay a tax for the support of the Army; this fund to be devoted to the use of the corps of non-commissioned officers.

It will be useful to state, before finishing this subject, the different strengths in which non-commissioned officers are distributed in the Armies of Europe. The best idea of their relative importance will be got by looking at the organization of a company and also that of a regiment. The latter is the largest unit in which non-commissioned officers appear in the combatant strength of an Army (in Brigades and Divisions those employed at head quarters being usually clerks, &c.); while the former, in continental Armies, is a tactical unit of great importance. In the following lists, the cadets are placed separately; the sergeant-majors and sergeants are classed as non-commissioned officers, properly so called; and finally also corporals and lance-corporals are put by themselves. The importance of these ranks probably varies in different Armies, but they are placed as above for the purpose of comparison.

#### *England.*

A battalion on a war strength contains:—

3 Field Officers, 25 Officers, 49 non-commissioned officers, 40 corporals, and 960 privates.

#### *Germany.*

Company peace footing:—

4 Officers, 1 *fähnrich*, 6 non-commissioned officers, 20 corporals and lance-corporals, and 106 men.

Company war footing:—

5 Officers, 1 *fähnrich*, 6 non-commissioned officers, 37 corporals and lance-corporals, and 201 men.

A regiment is composed of 3 battalions of 4 companies each. The regimental and battalion staff consist of:—



5 Field Officers, 4 Officers, and 4 non-commissioned officers.

Regiment on a war footing is (not counting non-combatants):—

5 Field Officers, 64 Officers, 12 *fähnrichs*, 76 non-commissioned officers, 444 corporals and lance-corporals, and 2,288 men.

#### *France.*

Company peace footing:—

3 Officers, 6 non-commissioned officers, 8 corporals, 66 men.

Company war footing:—

4 Officers, 10 non-commissioned officers, 17 corporals, 224 men.

A regiment is composed of 4 battalions of 4 companies each and 2 *depôt* companies, the latter having the same cadres as a company on a peace footing, but 170 men instead of 66. The regimental and battalion staff consist of:—

7 Field Officers, 5 Officers, and 4 non-commissioned officers (*adjudants*).

Regiment on a war footing is (not counting non-combatants):—

7 Field Officers, 69 Officers, 148 non-commissioned officers, 256 corporals, and 3,584 men; and a *depôt* of 12 Officers, 12 non-commissioned officers, 16 corporals, and 340 men.

#### *Austria.*

Company peace footing:—

3 Officers, 1 cadet, 5 non-commissioned officers, 10 corporals and lance-corporals, and 70 men.

Company war footing:—

4 Officers, 1 cadet, 5 non-commissioned officers, 30 corporals and lance-corporals, and 180 men.

An Austrian battalion has 4 companies; and an infantry regiment in war time is composed of a field regiment, a reserve regiment (or 5 field battalions) and one *ergänzung* battalion (which has no cadet). The regimental staff is composed of 8 Field Officers, 8 Officers, and 11 non-commissioned officers.

Regiment on a war footing is (not counting non-combatants):—

8 Field Officers, 108 Officers, 20 cadets, 125 non-commissioned officers, 750 corporals and lance-corporals, and 4,500 men.

#### *Russia.*

Company peace footing:—

3 Officers, 1 *younker*, 9 non-commissioned officers, 16 corporals, 80 men, and 4 reserve men without arms.

Company war footing:—

4 Officers, 1 *younker*, 17 non-commissioned officers, 20 corporals, 148 men, and 12 reserve men without arms.

Battalion staff, 1 Field Officer and 1 Officer.

Regimental staff, 5 Field Officers and 1 Officer.

A regiment consists of either 3 or 4 battalions, and each of these is composed of 4 field companies and 1 rifle company.

Regiment of 3 battalions on a war footing is (not counting non-combatants):—



8 Field Officers, 64 Officers, 15 youngers, 255 non-commissioned officers, 300 corporals, 2,220 men, and 180 reserve men without arms.

*Italy.*

Company peace footing :—

4 Officers, 7 non-commissioned officers (2 of these corporal-majors), 13 corporals and lance-corporals, and 73 men.

Company peace footing :—

5 Officers, 13 non-commissioned officers (4 of these corporal-majors), 33 corporals and lance-corporals, and 145 men.

A regiment consists of 3 battalions of 4 companies each; the regimental and battalion staff consist of :—

5 Field Officers, 4 Officers, 10 non-commissioned officers (of which 3 are corporal-majors) and 1 corporal.

Regiment on a war strength is (not counting non-combatants) :—

5 Field Officers, 64 Officers, 166 non-commissioned officers, 327 corporals and lance-corporals, and 1,740 men.

# ESTIMATES FOR THE ITALIAN NAVY FOR 1878, AND ACCOUNT OF THE NEW IRONCLAD "ITALIA," BUILD- ING AT CASTELLAMARE.

(Translated from the "Révue Maritime et Coloniale.")

THE provincial budget for the year 1878 has been already presented to Parliament by the Government of Italy. The preliminary statement puts forward figures not very different from those of last year. As to the Navy, the proposals are presented in the following manner :—

Lire.

The total estimate, as voted in the past year 41,630,778

Increase for 1878 ..... 2,315,329

Total 43,946,107 = £1,750,000.

On one side the reconstruction of the *matériel* of the Navy, on the other a larger number of ships commissioned and an improvement in the position of the petty officers, have made an increase in the estimates appear necessary.

The Naples newspaper, *Il Piccolo Giornale Della Sera*, of November 5th, contains some information regarding the new ironclad, the "Italia," on the stocks at Castellamare, which has appeared to us of sufficient interest to be brought to the knowledge of our readers.

This ironclad, the largest of all the ships of war in the world, has the following dimensions approximately :—

Length .....	393·7 feet.
Beam .....	72·0 "
Mean draught .....	27·9 "
Depth, upper deck to keel .....	49·2 "
Displacement, load .....	13,000 tons.
Weight of the hull, on launching	5,000 "

The hull is so constructed as to constitute a sort of gigantic armed girder. A double bottom 302 feet long, 65 feet wide, and  $3\frac{1}{4}$  feet deep, divided into cells, protects the lower parts of the ship against the effect of torpedoes. Two longitudinal water-tight bulkheads run from the fore part to the after part of the ship, so as to form, in horizontal projection, 53 large compartments (40 above the double bottom, 3 abaft, and 10 forward). These compartments, in turn, are divided from top to bottom by four watertight decks:—

1. The deck, plated with  $2\frac{1}{2}$  inches of armour, situated about  $8\frac{1}{4}$  feet below the water-line, presenting a considerable curve ( $3\frac{1}{4}$  feet).

2. A deck, forming a hollow girder, 4 feet 10 inches above the water-line. Between these two decks are compartments filled with cork; to this space the armoured belt exactly corresponds, but the Italian paper does not mention side armour.

3. The battery deck, 14 feet above the water-line.

4. The upper deck, 21 feet above it.

On the upper deck is fixed the armoured citadel, oval in form and 6 feet 6 inches high, the axis of this oval makes an angle of about  $20^\circ$  with the keel; the guns fire *en barbette* and are placed symmetrically at the extremities of the citadel. The space comprised between the second deck and the upper deck does not seem to be armoured. The funnels and the passages for the supply of powder only are surrounded by plated casings, starting from the armoured deck; but whilst the first have only a moderate height, the others are carried up to the citadel. The vessel is to be propelled by two screws of 19 feet diameter; each of them being worked by an engine of six cylinders. The boilers will be twenty-six in number. The power expected is to be 18,000 horse-power, and it is hoped that a speed of 16 knots may be attained.

Without attaching over importance to information collected in the communication of a newspaper reporter, it is not beside the question to remark that the figures of the principal dimensions agree very fairly with the information published concerning the first constructed large Italian ironclads, the "Duilio" and the "Dandolo." The "Italia" ought to be a vessel having nearly the same general fineness of form. If we calculate, by analogy with the former vessels, the surface of her midship section, we shall find it to be about 473·13 feet. From this, then, it would result, that in order to attain a speed of 16 knots, there should be exerted a power of about 125 horse-power per square metre of the midship section; though it may generally be admitted that from 90 to 100 horse-power is more than sufficient. Moreover, supposing that the boilers have each three furnaces, and that every one of them develops 200 horse-power, which would be a

high maximum, we reach a figure of 15,600 horse-power. There is ground, therefore, for these two reasons, to consider the power mentioned as somewhat exaggerated.

The armament is not mentioned, but it would seem probable that it will be composed of four guns of 100 tons, mounted in pairs on turntables. The form adopted of a casemate surrounding the two turntables, instead of two separate turrets, as on board the "Dandolo," has for its object the diminution of the development, and, consequently, of the weight of such a surrounding.

It seems strange that a protected deck placed below the water-line and running throughout the entire length of the ship should have been adopted. That, where there is no side armour, before and abaft, the armoured deck should be placed below the dividing compartments, is a necessity; but where there is the protection of an armoured belt, it is evident that the plated deck ought to be carried to the upper part of that belt, instead of creating a sort of reservoir, in which projectiles striking in a plunging direction must necessarily explode.

It is very probable that these early *data* will be modified hereafter, but they are not the less interesting as characteristics of the new steps made in the path of building gigantic ships. It is very possible that this will be the last, and that, instead of seeking to produce marine Colossi, a return will be made—in displacements of 8,000—to the dimensions of manageable ships, and to a cost such that it will not be necessary to stake our total resources on one or two elements of a problematical success.

(Signed) P. DISTERE,  
*Sous Ingénieur de la Marine.*

## FLOATING OF THE STRANDED FRENCH MAN-OF-WAR "ESCOPETTE."

From the *Moniteur de la Flotte* of February 10th.

WE announced in a recent issue the floating of the gunboat "Escopette," belonging to the naval division in Indo-China, which had grounded by touching an unknown rock on her way to Baria. The work of saving her has been accomplished with devotion, energy, and perseverance.

The operation was divided into two parts. From the 29th of October to the 6th of November, the object was to get the chains, intended to lift the gunboat, into place. This work was rendered very arduous by the nature of the bottom, a soft mud, in which the "Escopette" was imbedded, and by the necessity of working at a particular time of tide, however great the heat of the sun. The depth of water was  $6\frac{1}{2}$  fathoms. It was not till the 16th of November that the second portion of the work could be taken in hand: it was to raise the wreck and transport it to a hard bottom dry at low water.

On the 18th was reached, in a depth of  $5\frac{1}{2}$  fathoms, the entrance of an *arroyo*, hitherto unsurveyed, in which M. Havard, Captain of the "Framée," had marked a bank of hard sand, which uncovered at low water, and on which it was necessary to place the "Escopette" at first, in order to temporarily stop the leaks, and put her in a condition to be towed to Saïgon without the help of lighters. The distance intervening between the starting point and this bank was a mile.

It was only on the 21st, after many difficulties, that they were able to place the "Escopette" on the top of the sand-bank. Two engineers of the "Framée," the 2nd class engineer, Journaux, and the stoker-mechanic, Pascal, took steps to stop the leak. It was necessary, to achieve this result, to attach to the hull close to the keel, two plates of sheet-iron, each about  $5\frac{1}{2}$  feet long, kept in place by a hundred bolts, compressing coverings of woollen stuff. As soon as the fall of the water allowed the work to be resumed, these two men began without delay, one outside in the muddy water up to his waist, the other inside with his head and body under the boilers; both worked with admirable energy and persistence.

On the 26th, the gunboat floated without making any water, and arrived at Saïgon on the 27th, at 7 o'clock in the evening, her hull being perfectly dry. Although having often worked during the hottest hours of the day, occasionally without any shelter from the sun and always in the muddy emanations from the *arroyo*, none of the men who took part in getting the vessel afloat have been ill. This result is due to the excellent superintendence of the men by Lieutenants Chassérian and Havard, who were in charge. The engineers Journaux and Pascal have obtained special promotion in their class, and a communication expressing the satisfaction of the Minister of Marine has been addressed to the Officers and men who were engaged in the work.

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## THE RUSSIAN ESTABLISHMENT AT VLADIVOSTOCK.

(Translated from the *Rivista Marittima*.)

FROM a report made by the distinguished Cavaliere Canearo, commanding the "Cristoforo Colombo," to his Excellency the Minister of Marine, we have extracted a portion which has a general interest, and we believe that in publishing it we are conferring upon our readers a real present.

"Simonoseki, 31 August, 1877.

"Russia has made an important acquisition on the coast of Manchouria, ceded to her by China a few years back. Although the Czar already possessed the whole eastern coast of Siberia, his dominion over the inhabitants of the seashore was only exhibited in several military establishments like Petro-Paulosk and Nicholaïevsk, and a few others of inferior importance, which had no vitality of their own, and cost the Central Government a great deal without



“being capable of ever rendering the services demanded by the Russian Navy, on account of the serious inconveniences, due to climate and the hydrographical position of the places selected. In possession of Manchouria, the Russians chose Vladivostock as a site for a colony, and in order to make there a respectable naval establishment: for four years they worked at it with such activity that they have made a settlement of from seven to eight thousand inhabitants arise, in which are being concentrated the resources which had previously been established at other stations.

“In spite of their goodwill and the money expended, this new station is still far from being a colony properly so called, from having a naval arsenal, and from being suitably fortified with due regard to the object kept in view. It is difficult to obtain statistical data concerning the population and the resources of the settlement, because of the precautions taken against it and the difficulties in the way of settling there experienced by foreigners. The extension of the colony is solely due to the impulse of the Government, principally by means of convicts of both sexes from Siberia, to whom, as a reward for good conduct, are let dwellings and given land to cultivate. There are, however, several Germans and English who carry on a trade with Europe in furs; also, a few Frenchmen and one Italian who are innkeepers. The greater part of the business is carried on by Chinese with Shanghai, in small numbers, however, as they are ill adapted to bear the excessive strictness of the authorities.

“It is asserted that in the neighbourhood there are gold mines, but the results are a secret, they being worked on behalf of the Government. From a naval point of view the harbour is magnificent, as it is sheltered from all winds, can be easily defended, and is accessible to ships of every class; however, at present there are neither basins nor building slips, and there only exist some storehouses and dépôts of *matériel*; but the locality is perfectly fitted for the erection of a good naval establishment. As a military port Vladivostock can be defended on the side of the sea by a few batteries and a few torpedoes, the more easily as during the winter no one can approach it, because the water within the harbour and in the bay outside freezes to a distance of several miles. On the land side it can be effectively defended, on account of the favourable disposition of the hills. Still, in case of war, the colony would be completely isolated, as its easiest communications are by sea with China, Japan, and the United States of America; whilst by land it is so remote from the centre of Russia that assistance could not reach it across Siberia, for the postal service takes three months to carry a letter to St. Petersburg.

“From a comparison of these particulars, it is certain that no great idea must be formed of Vladivostock, but still its importance is manifest, if we consider that in a few more years Russia can make there an imposing naval station, which, in case of war, may furnish ships destined to cruise in the Pacific, and more especially in the Japan and China seas, to oppose European influences. At the

“present time there are in the harbour six ships of war suitable for long cruises. They are fitted out to perform the same duty as that performed by the ‘Alabama’ during the American War of Secession. The Russian Naval Officers count much on them and have already completely organized their crews.

“In recapitulation, I would say to your Excellency that, although Vladivostock has a relatively temperate and healthy climate, fertile and rich soil, and an admirable hydrographical situation on the Japan Sea, it seems not likely to soon become an important part for population and commerce, the Russian system of colonization not being favourable to ventures of such a nature. But, at the same time, this advanced military post of Russia may soon be a menace to the interests of the other nations of Europe in these distant parts of Asia, and in a few years may become a danger.”

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## NOTICES OF BOOKS.

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*A Manual of Naval Architecture*, for the use of Officers of the Royal Navy, Officers of the Mercantile Marine, Shipbuilders, and Shipowners. By W. H. WHITE, Assistant-Constructor, R.N. London: John Murray, 1877. 1 Vol. Size 9 in. x 6 in. x 2 in. Pp. 664. Weight, 3 lbs. Price, 24s.

In this manual we have a work of great value, and we may safely say that the author has to a very full extent fulfilled the object that we are told in his preface he had in undertaking its publication.

Undoubtedly, the book, written as it is in language and phraseology that can be easily understood by the uninitiated in the technicalities of marine architecture, is exactly what is required by naval Officers and others interested in the general principles of scientific shipbuilding.

Mr. White, as lecturer and instructor at the Royal Naval College, Greenwich, in this important branch of naval science, is in a position to gather from his audience and pupils the nature of information that is sought by naval men; the language best suited for explaining his subject to them; and also the amount and description of knowledge it is necessary that Officers of the Royal Navy should possess, so as to place them in the position of being able to supply useful and practical information to naval architects for the furtherance of the science of shipbuilding. In his office of Assistant-Constructor, Mr. White has access to all the reports and documents that have passed into the hands of the department, on his subject. The author has made good use of these advantageous positions, and with a skilful pen has produced a work that we can strongly recommend to the notice and use of the naval world.

In briefly tracing the principal features of the “Manual,” we notice that the first four chapters are full of useful and practical information; that the chapter following these, on “Deep Sea Waves,” is interesting but almost entirely theoretical, and treats of a subject of which comparatively little or nothing is known; Chapter VI is in the same strain, and is followed by another that can hardly be considered more

than a description of how the search for knowledge on the questions of wave motion, and the oscillations occasioned by moving water acting on a floating body, may be best conducted. We now come to three most practical chapters, on the strain experienced by the structural strength of, and the materials for, building ships; but of the whole work, perhaps Chapter XI, on the "Resistance of Ships," contains the most valuable and interesting information. Mr. Froude is here freely quoted, and it is in this chapter that the lines of ships with a view to speed are treated, as also the various resistances offered in opposition to a ship's progress; so important are the questions involved in this part of the work, that we would suggest to Mr. White the desirability of enlarging on them in a future edition, should he find leisure to do so. The remainder of the book, dwelling on the propulsion and steering of vessels, is full of useful and important information. Throughout his work the author's strong point is the concise, impartial, and comprehensive manner in which he treats and compares the different matters referred to. An additional recommendation is to be found in the admirable type in which the volume is published, and the numerous, lucid, and well-designed diagrams explanatory of the subject discussed, with which its pages abound.

We may say, with all honesty, that the gratitude of the Navy is due to Mr. White for supplying such a valuable addition to its literature; and that we shall ever be ready to welcome the appearance of his works, when written with the same degree of ability and good intention.

G. H. N.

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*The War Ships of Europe*; being the substance of a work recently published in America, by Chief Engineer KING, U.S.N., revised and corrected throughout, with additional notes, by an English Naval Architect. Portsmouth: Griffin and Co., 1878. Pp. 338. Size  $5\frac{1}{4}$  in.  $\times$   $7\frac{3}{4}$  in. Weight 20 oz. Price 10s. 6d.

IN the last number of the Journal we noticed a book on the war fleets of the world—*Les Navires de Guerre les plus récents*—by a French Naval Constructor, M. Marchal. It is now our good fortune to be able to call attention to a similar and even more important work on the same subject written in our own language. The publication of this book may be taken as evidence of the increasing interest which in this country, no less than abroad, is now paid to naval affairs. Unfortunately we are not yet able to bring under the notice of our readers works of this nature which we owe solely to the pens of our own countrymen; we still have to depend for information, for compendious information at all events, concerning even the ships of our own Navy, upon the labours of foreigners. Still this carries with it a certain consolation; we are more likely to obtain from them an unprejudiced view of the real state of our *matériel* and its comparative value with those of other nations. No foreign observer is likely to seduce us into over-estimating the qualities of the vessels which we do possess; and, by relying upon his judgment, we are not very likely to commit the fault of indulging in an undue opinion of our own superiority.

In the book under review, we have a complete cyclopædia of the effective strength in ships of all the navies of Europe. Few important ships, perhaps no important class of ships, is altogether omitted from notice in this singularly interesting book. With the exception of the newly designed, and we believe already laid-down Italian vessels, "Italia" and "Lepanto," a clear and full description of all the most powerful components of European navies is offered to the reader. Mr. King was sent to Europe in the summer of 1875, by the Secretary of the United States' Navy, and was steadily employed for a year in visiting the dockyards and naval ports of various countries, and collecting information on naval matters. The book, therefore, is an official document; a report to the Minister of the result of Mr. King's inquiries. It has thus all the gravity and accuracy which we should expect from such a document, and is rendered all the more important by being the production of a professional expert. Its value, we need hardly remark, has been very considerably heightened, in the present edition, by the editor being an English Naval Architect, whose opinion, it is not difficult to perceive, is quite as worthy of consideration as that of Mr. King himself, and whose opportunities have enabled him to correct any



errors in the original report. A glance over the list of contents will show how varied they are. The work does not deal exclusively with ships, armoured or unarmoured. There are chapters devoted to the consideration of compound engines, marine boilers, sea valves and cocks, offensive torpedo warfare, British naval dockyards, the Royal Naval College, besides those which deal with the fleets of the naval powers of Europe. At the end is an extensive appendix, in which we find detailed information concerning Her Majesty's ship "Devastation," and other ships of the Royal Navy, and lists and dimensions of the ironclads belonging to several foreign countries. To give an idea of the fulness of some of the descriptions we have only to state that the "Inflexible," "Devastation," "Thunderer," and "Dreadnought," have each a chapter to themselves, whilst another chapter is occupied with a discussion of the cost of building armoured ships for the British service. It must not be supposed that the book is a mere report on the different vessels which fly the national flags of Europe, simply giving an account of their number and a description of the system of their construction. Written, as we have before said, by a professional expert, it is interspersed with critical remarks of considerable and striking acuteness, which those who read will do well to lay to heart. Remarks of a similar kind are occasionally to be found in the notes added by the editor. This naturally lends to it additional interest, and it will not be necessary to say that it is thereby rendered very much more valuable. The observations of the policy of the French and of the Austrian constructive authorities are eminently deserving of attention, as also are those (see p. 184) on the Russian fleet. With this book in his possession, nearly every naval Officer has the means at hand of finding out almost everything about the ship to which he belongs, as far as her design is concerned. He may indeed, in many cases, go much farther; her qualities, her cost, and even the policy which dictated her design will be explained for him. More than that, he will be able to learn very nearly as much about the ships of those powers with whose flag during his service afloat he is constantly falling in. This information, as said above, will be conveyed to him on unquestionable authority and, we may add, with great clearness. The book is well illustrated, and besides is handy in size, well printed, and altogether excellently got up. We consider it highly deserving of the notice of naval Officers.

C. K. G. B.

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*A Manual of Telegraph Construction.* By JOHN CHRISTIE DOUGLAS. Published with the approval of the Director-General of Telegraphs in India. London: Griffin and Co., 1877. Size  $7\frac{1}{2}$  in.  $\times$   $5\frac{1}{2}$  in.  $\times$  2 in. Pp. 491. Weight  $1\frac{1}{4}$  lbs. Price 15s.

THE existing works on telegraphy touch very slightly on the mechanical principles on which telegraph structures should be designed, so as to secure the utmost durability with the least expenditure.

Mr. Douglas ably supplies this want. He has collected a great mass of information from many sources, and gives numerous formulæ.

In the chapter on "The Theory of Submersion of Submarine Cables," an error is pointed out in Messrs. Clarke and Sabine's "Table of the tension of Cables when "payed out at different angles," and the author shows that a cable does not hang in a catenary during that operation.

Part II is devoted to a description of materials and the methods of preserving and preparing them for use; methods are given for constructing lofty masts to carry wires across rivers. Such structures are not in favour in this country, but are largely used abroad.

In Part III we have a full description of the method of estimating for and constructing overhead, underground, and submarine telegraph lines, and in an appendix a very brief account of "The result of the experience gained during the Abyssinian, "Ashantee, and Looshai expeditions, the Franco-German war, and the autumn "manœuvres," in the erection of temporary lines. One of these is said to be, that the arrangements for paying-out and picking up the wire at a trot by the use of horses



and mechanical appliances are practically useless; this hardly agrees with the experience of our Field Telegraph Troop; but another opinion "that it is better to "use full sized instruments than small portable ones" for military purposes, will be endorsed by practical telegraphers.

In conclusion it must be noted that although Mr. Douglas only professes to deal with principles, nevertheless the practical value of his book would be much higher if it were more fully illustrated with diagrams, the application of the formulæ shown by examples, and much irrelevant matter omitted.

H. F. T.

*Dictionary for the Pocket.* French-English and English-French. By JOHN BELLOWS. 2nd edition. London: Trübner and Co., Ludgate Hill. 1877. Price 10s. 6d.  $4\frac{3}{4}$  in.  $\times$   $3\frac{1}{4}$  in.  $\times$   $\frac{3}{4}$  in. Weight under 6 oz.

THIS is an excellent and complete pocket dictionary; the plan on which it is constructed is, so far as we know, novel. The book contains besides the mere vocabulary a fund of valuable information, and it is far superior in every way to the ordinary run of pocket dictionaries; it is remarkable not only for the amount of matter contained within its pages, but also for the ingenuity displayed in arranging this matter satisfactorily. The book is well worth its price.

*Les Machines Infernales dans la Guerre de Campagne. Application de la Théorie des Mines.* Par H. WAUVERMANS, Lieutenant-Colonel Commandant du Génie de la Ville d'Anvers. Deuxième édition. Bruxelles: Libraire Militaire Muquardt, 1876. Pp. 164. Size  $6\frac{1}{2}$  in.  $\times$   $4\frac{1}{2}$  in.  $\times$   $\frac{3}{4}$  in. Weight 9 oz.

THE first three chapters are rather interesting to the general reader than useful to the student, Chapters I and II giving a short history of the progress of land and "submarine" mining, and Chapter III treating of the different modes of firing charges (whether by powder, hose, or electric fuses) in a cursory manner.

Chapter IV is well worth reading. It discusses the theory of the action of land mines, and gives practical rules for determining the charges, forms of crater, radius of indirect effect, &c., whether for ordinary, undercharged, or overcharged mines. From a consideration of the proportion of the charge expended without useful effect in the different cases, the author evolves a general formula embracing all the above classes of mines. It is understood that this formula has been tested practically with good results; it will, therefore, be interesting to those who have been accustomed to work with independent formulæ for each variation in the form of the crater.

At the end of the chapter there come a few notes on the use of detonating substances for the above purpose, but the author admits the want of experience therein, apparently, however, agreeing with the general judgment that for mining proper gunpowder is preferable.

Chapter V is on concealed charges, giving a general description of a large number of methods of firing, either automatically or at will. The information in this chapter is rather in the shape of "hints" than in a working form.

Chapter VI discusses at length the charges, ranges, and construction of different forms of fougasses.

Chapter VII is on petards, and is chiefly historical, but gives a few useful examples of their application.

Chapter VIII treats of the miscellaneous employment of explosives, the examples given being chiefly of the class known as hasty demolitions. Alternative rules for the employment of gunpowder and dynamite are given; the latter substance would doubtless be useful in cases where it alone was procurable, but they seem to indicate that dynamite is inferior in power for these purposes to the gun-cotton employed in the English service.

R. Y. A;

*On the Supply, Care, and Repair of Artillery Material*, including Small Arms and Ammunition for Canadian Militia. By CAPTAIN OSCAR PRÉVOST. Pamphlet. Pp. 58. Quebec, 1877.

THIS is an Essay, written for the Medal given by the Governor-General of Canada. It has received honourable mention. It is a very creditable production, and the writer has evidently carefully studied his subject.

*Tactical Examples*. By HUGO HELVIG, Major on the Royal Bavarian General Staff. Vol. II. "The Regiment and Brigade." Translated by Colonel Sir Lumley Graham, Bart. C. Kegan Paul and Co. London, 1878. Size 9" x 6" x 1". Pp. 127. Weight under 1½ lbs. Price 10s. 6d.

THE appearance of this volume is singularly well timed, as the period of exercise in Minor Tactics is just commencing at our principal military stations. The example contains illustrations of the working of the three arms. The design of the whole work was explained in No. 93 of the Journal.

H.

*The Armenian Campaign*. A Diary of the Campaign of 1877 in Armenia and Koordistan. By CHARLES WILLIAMS. 1 vol. London: C. Kegan Paul and Co., 1878. Price 10s. 6d. Size 8" x 5½" x 1½". Pp. 336. Weight under 1¾ lb.

*Armenia and the Campaign of 1877*. By C. B. NORMAN, late Special Correspondent of the *Times* at the seat of war. 1 vol. London: Cassell, Petter, and Galpin, 1878. Price 21s. Size 8¾" x 6" x 2". Pp. 484. Weight under 2 lbs.

*The War Correspondence of the Daily News*. Second edition, containing a full description of the taking of Kars. 1 vol. London: Macmillan and Co., 1878. Price 10s. 6d. Size 7¾" x 5½" x 1½". Pp. 643. Weight under 1½ lb.

*The Narrative of an Expelled Correspondent*. By FREDERICK BOYLE. 1 vol. London: Bentley and Son, New Burlington Street, 1877. Price 14s. Size 9" x 6" x 1½". Pp. 424. Weight under 2¼ lbs.

IF we cannot hope to obtain with regard to the late campaign anything approaching in completeness and accuracy the German official account of the Franco-German war, it is nevertheless probable that at a future time we shall receive from some nation whose military representatives at the theatre of hostilities were more welcome than our own, some comprehensive and authentic history of this important struggle. It is possible that the Russian Staff, fired by emulation of its neighbour, may itself publish the desired information. Meanwhile we must avail ourselves of the valuable stores provided by the energy, industry, and intelligence of newspaper correspondents. The four books above given are, so far as we are aware, the only collected series of correspondence at present published. In studying the contents of these books, it is well to bear in mind the caution candidly given by one of the writers, Mr. Williams.

Mr. Williams frankly says: "No pretence, it may serve some misconception to say, is made at impartiality, which, however desirable for journalists commenting at home upon the progress of events, is virtually unattainable by correspondents recording the succession of those events among all the excitement and all the myriad influences of life in a camp.

"But it may be doubted whether it is either the duty or in the power of a cor-

"respondent, mingling daily and hourly with soldiers fighting for the integrity and independence of their nation, for their 'hearths and homes,' to preserve that calm balance of mind which it is the duty of the leader-writer, the editor, and the statesman to endeavour to cultivate; consciously or unconsciously he must be biassed; it may, as in my case, be in favour of the soldiers among whom he dwells, or, as in the instance of more than one of my *confrères*, against the people and the Government which afford him the hospitality of their lines."

It may be well to state that Mr. Boyle's duties<sup>a</sup> as correspondent lay in European Turkey. The titles of the other books give the necessary information as regards the localities of which they treat.

*Sea Terms and Phrases in English.* For the Use of Officers of Royal and Mercantile Navies, Engineers, Shipbuilders, &c. By Lieut. E. PORNAIN, French Navy. 1 vol. Portsmouth: Griffin and Co., 1877. Price 4s. Size  $8\frac{1}{4}'' \times 5\frac{1}{2}'' \times \frac{3}{8}''$ . Pp. 159. Weight under 7 oz.

A useful compendium.

*Handbook to South Africa.* Including the Cape Colony, Natal, the Diamond Fields, the Trans-Orange Republics, &c. 1 vol. 2nd edition. London: Silver and Co., Cornhill, 1876. Price 10s. Size  $7'' \times 5'' \times 1\frac{3}{4}''$ . Pp. 539. Weight under  $1\frac{1}{2}$  lb.

*Handbook to the Transvaal.* British South Africa, its Natural Features, Industries, Population, and Gold Fields. 1 vol. London: Silver and Co., 1877. Price 2s. 6d. Size  $7'' \times 5'' \times \frac{1}{2}''$ . Pp. 125. Weight under 7 oz.

*Map of the Transvaal and the Surrounding Territories.* By F. JEPPE, F.R.G.S. London: Silver and Co., Cornhill, 1878. Price 7s. 6d. Size 2 feet square. Scale  $\frac{1}{1850000}$ , about 30 miles to the inch. Limits  $23^{\circ}$ — $33^{\circ}$  W. Long.,  $21^{\circ}$ — $40^{\circ}$  S. Lat.

*Stanford's Compendium of Geography and Travel. Africa.* Edited and extended by K. JOHNSTON. 1 vol. London: Stanford, 1878. Price 21s. Size  $8\frac{1}{4}'' \times 6\frac{1}{4}'' \times 2\frac{1}{4}''$ . Pp. 611. Weight under  $2\frac{3}{4}$  lbs.

THE above-named works will be found useful at the present time.

#### RECEIVED.

*Cavalry Tactics.* By a Cavalry Officer.

*Der Kaiserlich Deutsche Marine.* By BULOW.

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### LECTURE.

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Friday, February 15th, 1878.

ADMIRAL SIR FREDERICK W. E. NICOLSON, Bart., C.B., Vice-President, in the Chair.

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#### ON THE LAWS AND CUSTOMS OF WAR AS LIMITING THE USE OF FIRE-SHIPS, EXPLOSION VESSELS, TORPEDOES, AND SUBMARINE MINES.

By Admiral the Right Honourable LORD DUNSANY.

I AM now about to give what, according to the laws and customs of this Institution, is called a "lecture" upon a particular point in the laws and customs of war. We are accustomed in this place to hear gentlemen fresh from the seat of war, or inventors of telephones, or Thorneycroft torpedoes, and we naturally listen to them with great attention, because we know they can tell us much more than we know ourselves. In my own case I have no such claim on your attention. I am not a great jurist, or any jurist at all. I am not a great writer on international law like "Historicus;" I would, therefore, prefer to discard the word "lecture" and call this paper an essay. I can only pretend to have thought out this subject to the best of my ability, and to have consulted, I hope with due diligence, the principal authorities on the subject, in doing which I have been under great obligations to the kindness of a friend I see opposite, who gave me facilities in the British Museum. I must further apologize to any learned jurist who may be present, and some distinguished jurists have been invited, for what may appear like depreciating their authority. To ignore the immense services rendered to mankind by the learned civilians, and especially such civilians as Lord Stowell, would only betray one's own ignorance; I simply deny that it is their province to make laws



for carrying on wars under new circumstances. To any Officers of the Torpedo Branch, some of the most promising and intelligent Officers of the Navy, I need scarcely say, if the slightest taint of dishonour attached to that branch they would not be found in it. At present, torpedoes are as lawful as any other means of warfare. There are those who contend that such means are not in the least objectionable on the score of humanity, that they will shorten war, or find some other compensation for their apparent mischief. It is also said with great force that on the introduction of shells, for instance, the same objections were raised on the score of humanity, and yet we have come to be perfectly reconciled to them. Regarding the principal authorities on the laws of war, I confess that a tolerably extensive research in the British Museum has not thrown much light on the matter; but torpedoes and submarine mines could no more find a place in the old jurists, such as Grotius and Vattel and others, than could rifle guns and breech-loaders find a place in Cæsar's Commentaries. The later jurists, again, have not yet had the facts before them upon which to build a theory. For it must be remembered that in the usages of war the practice precedes or makes the law, not the law the practice, and new cases make new laws. The latest instances of this, perhaps, arose out of the employment of balloons during the siege of Paris. During the siege of Paris some balloons were captured, and a knotty point arose as to what position the prisoners ought to be considered in. The French writers on the subject, those who have written, like Charles Heffter and others since the siege, consider that they were at worst nothing more than blockade-runners. The German authorities, on the other hand, considered that they came, in some degree, under the category of spies—in any case they sent them before a court-martial, and I understand it would have fared ill with some of them, including, I believe, a countryman of our own, if the war had not very opportunely for them come to a conclusion. It seems to me that there always has been upon certain points an unwritten law, a general consent of opinion, whether among our land or sea Officers which has governed their practice. This has been antecedent to, and independent of, the so-called "law of nations;" but it has grown into a tradition, and in time becomes public law. Such, for instance, is the old naval tradition that the crews of fire-ships are not entitled to quarter. That such was the universal opinion of the Navy in my boyhood I distinctly remember, and my own recollection concurs with that of many Flag Officers with whom I have consulted. I may add, in passing, that in 1809, the latest occasion on which we used fire-ships ourselves, in the Basque Roads, when the expedition was under consideration, the belief that the enemy would act on the principle of not giving quarter materially influenced the Admiralty. I shall, however, have more to say on the subject of fire-ships, the progenitors of our torpedoes, submarine mines, and other novel modes of warfare. I hope to show that the apparently cruel rule respecting fire-ships worked well for humanity in practice. Whether it should be extended to other cases, and if so, to what cases, is a serious matter for your consideration. I should state I consider if this essay has any value, it will rather be in its

suggestiveness and the opinions it may elicit, than in anything that is contained in it in the way of my own opinion.

But is some such rule necessary? Looking to the tendency—the increasing tendency—towards what would have been called “illegitimate warfare,” some may think it necessary or at least expedient. Let us then glance at what has been the progress of this tendency during the last century, and the point is not without interest, for the change that has taken place has been in a contrary direction to that we might have expected.

Going back more than a hundred years, in 1759, we find the Marechal de Conflans, who combined the dignities of Field-Marshal and Admiral, issuing an order against the use of hollow shot,—incendiary shell in this case. His words are remarkable. He says they were “not generally used by polite nations, and that the French ought to fight according to the laws of honour.” We may pass over forty years to the battle of the Nile in 1798. It was, as we all know, a battle sternly fought out with round and grape, but by one of the thousand accidents in naval war the French flag-ship “*L’Orient*,” a magnificent three-decker, took fire and blew up. Mutual animosity was at its height in those days, and the French thought they could not blacken the character of the victors better than by charging them with using incendiary missiles. This charge was untrue, but it expressed the feeling of the day. The English retorted that they found incendiary shells in one of the prizes. Passing over two instances in which we used fire-ships, as that is a topic to which I must return, let us examine a very remarkable incident that occurred in our war with the United States in 1812. It affords a very good gauge of opinion at that time, as a test of opinion in our own. The “*Ramilies*,” 74, was lying off New London, at anchor, maintaining the blockade. She was short of provisions, and two American merchants, knowing this, fitted out a schooner and filled the hold with powder, covering it over in the hatchways with barrels of flour. An ingenious piece of clockwork attached to a gun lock, and a train leading to the powder, ensured its explosion at the hour it was set to. The vessel was captured as intended, the crew escaping to land. According to ordinary calculation and probability, the prize would have been ordered alongside the “*Ramilies*” to be cleared, and in that case when the clockwork reached the fatal hour, 2.30, a loud explosion would have ended the history of the “*Ramilies*” and her 600 men under Sir Thomas Hardy—Nelson’s Hardy. As chance or Providence would have it, the schooner was ordered to anchor near another prize, but away from the “*Ramilies*,” and thus when the crisis arrived, there were no other victims than the prize crew. James, our standard naval historian, from whom I quote remarks, “We shall not trust ourselves to comment upon this most atrocious proceeding;” and a naval Officer, a contemporary, Captain Brenton, says, “A quantity of arsenic in the flour would have been so perfectly compatible with the rest of the contrivance that we wonder it was not resorted to. Should actions like this receive the sanction of Governments, the science of war and the laws of nations will degenerate into the barbarity of the Algerines, and pillage will take the place of kind-

"ness and humanity to our enemies." Such were the sentiments of two writers, one in military the other in civil life; and recurring to my own earliest recollections, I have no reason to doubt that they were the general sentiments of that day; perhaps they still maintain their hold upon the survivors of that generation. The young generation probably will view the matter in a different light. In any case, the incident as affording a test of two different schools of thought is interesting. If any young Officer of the Torpedo School is present, he may see little difference, in a moral point of view, as to how the explosion is brought about, and may think how much more surely it would have been effected in these days. Before quitting this incident, I am bound to say that it cannot fairly be held to reflect any blame on the Americans as a nation, who are as fond of fair fighting as ourselves in carrying on war.

Let us now pass from what we call the pre-torpedo period, when we were content with round shot, to our own more civilized days. The commencement of the period of more deadly weapons,—more sudden, secret, widespread destruction,—may, I think, be fixed in 1851-2. By a curious coincidence, or what in the phrase of the day would be called "the irony of history," two remarkable events signalized that date. The Napoleonic Empire, which had cost England 800,000,000*l.* to suppress, besides countless lives, and which all Europe had placed under a ban at the Treaty of Vienna, was revived and declared to be the "Empire of Peace." "*L'Empire c'est la paix.*" At home, on the 1st of May in that year, we inaugurated the millennium of perpetual peace and universal brotherhood in Hyde Park. The doors of the temple of Janus were closed, and those of the big temple of peace and commerce were opened. War was declared out of date. As every department of human industry was invited to that exhibition, I believe that some benighted persons like Armstrong and Whitworth and Lancaster sent specimens of their wares. Report said they were rejected, and the inventors told to take their obsolete toys to Fiji or the Cannibal Islands. I never heard that they did so, and perhaps it was as well that they did not. Well, two years passed, and then "a change came o'er the spirit of our dream." The new French Empire was established at the end of 1851, and Napoleon III had his hands full for the next twelve months. In 1853, however, his hands were idle, he had leisure to look abroad, and, as the pretty little nursery hymn tells us,

"Satan finds some mischief still  
For idle hands to do,"

it must have given zest to the author of mischief that it originated in the holy places, for you may read in Kinglake it was a squabble about the keys of the holy places between the Greeks patronised by Russia, and the Latins patronised by France, that really originated the Crimean War. Screw line-of-battle ships were among the first fruits of revived Napoleonism, and the Crimean War gave rise to the first ironclads—another idea of the Napoleon of peace. Ironclads being then apparently invulnerable, set people thinking of means to destroy them. For some time the contest was between iron plates and



guns, the guns growing larger and larger until Italy now possesses a gun that will throw a ton of iron some nine miles, nor is that likely to remain the maximum of artillery power. It is stated in the *Edinburgh Review* for October, "The great gun now in contemplation in Italy, in consequence of the experiments made at Spezzia, is to weigh 200 tons. The length of this enormous weapon will be 50 feet; the length of the bore, 44 feet; the diameter of the bore, 21 inches. The charge of powder will weigh 950 pounds; and the projectile, five feet in length, will weigh 6,000 pounds. This gun is calculated to be able to throw its shot for twelve miles, or as far as from Woolwich to the West-end." They have not yet reached a range that will cross the "silver streak," but even that does not seem quite impossible.

The history of our own torpedo schools is short, for we have had no experience of them except in the way of experiment. Some of those present must have heard Mr. Thorneycroft's lecture<sup>1</sup> on his torpedo vessel, and may remember the French experiment upon the old frigate "Bayonnaise." He could not have described the mischief done in more graphic language than he used by saying the breach made would admit an average omnibus. I believe one of our own experiments gave an even yet greater result; a breach 40 feet by 20 feet, that is to say, a hole that would admit four omnibuses abreast. I am not sure whether this breach was effected by a torpedo, properly so called, or by a submarine mine, for our school distinguishes the two, which the Americans do not. To the unscientific mind such a breach would appear very conclusive, but our naval architects I believe think the system of watertight compartments might save the ship. Yet one fancies a ship, with say 20 feet of keel blown away, would be like a man with some inches of his backbone extracted, rather limp and helpless.

The use of a torpedo, as discharged by one ship against another, does not seem to me any departure from open warfare. Submarine mines, on the contrary, have, or may have, in some circumstances a different character. We are, let us suppose, at war with France, and she, fearing an attack on Cherbourg, strews the approaches thickly with submarine mines; who questions the legitimacy of that act? Again, three or four Thorneycrofts steal into an English anchorage or narrow channel by night and perform the same operation—has it the same unexceptionable character? We must remember that practically the operator runs little personal risk unless you put him under the same rule as crews of fire-ships. The Thorneycroft torpedo-boat seems the complement, if I may say so, of torpedo submarine science. Mr. Thorneycroft told us that a yacht he built for Baroness Rothschild steamed 21 knots. He said further that he was prepared to build boats to maintain a speed of 25 knots, and the *Times* told us lately of one of them actually steaming 27 knots on the Thames. Has science spoken its last word in this branch? There is no reason to think so. Let us then suppose for facility of calculation three knots more gained, that is 30 knots per hour, one mile in two minutes. At anything above a mile—

<sup>1</sup> See Journal of the Institution, vol. xxi, No. 91, page 611, *et seq.*



1,760 yards—bow on, such a boat would present too small a mark to hit. Say the first shot is fired at one mile, in less than one minute, and before the smoke of the first gun has cleared away, the Thorneycroft is within torpedo range and launches her two torpedoes. We had the result the other day in the last exploit of the Russian steamer yacht “Constantine,” as given in the *Times*. The “Constantine,” cruising in the Black Sea, observed the look-out ship of the Turkish squadron, an ironclad, and detached a torpedo cutter against her. The cutter discharged two torpedoes, and the Turkish ironclad disappeared, leaving nothing but fragments on the surface of the water. The narrative says it was impossible to save the crew. I do not know whether they took the trouble to try. It must be remembered, however, that torpedo boats cannot pick up the crew of an ironclad if they care to do so, but an ironclad can save the crew of her pigmy foe. But a point I would call your attention to is the very small risk to the torpedo crew at which this wholesale destruction is effected. The huge guns of the present day make excellent practice, as I witnessed many days last summer; but they fire very slowly, and, so far as I could judge, the chances of hitting a torpedo-boat in motion would be *nil*.

In the case of submarine mines their use is of course confined to shoal waters. They may be either automatic (a ship touching them causing their explosion), or the operator may be miles away in electric communication. There also the operator might be in perfect security. In one experiment I saw of the kind, the submarine mine was intended to blow up a raft, which it did most effectually, sending a shower of small fragments up into the sky. But the explosion was effected not by one of the artillerymen, but by a fair lady standing by my side, who just touched with her thumb a little spring and did the work. She was in perfect safety. I do not mean to argue that she ought to have been hanged. But with regard to torpedo-warfare a remark made by a very intelligent Officer of the department struck me forcibly. In reply to some observation of mine, after witnessing some very successful experiments, he said, “We consider the art in its infancy only, but “believe it to be capable of great development.” If this infant Hercules can kick a hole 800 square feet in a ship’s bottom, what will he do full grown? A variety of this warfare seems to have been practised by the Confederates, which would certainly be more honoured in the breach than in the observance. That also we find detailed in the *Edinburgh Review*. I call your attention to it because it certainly seems to be on the verge of the lawful, if it is not beyond it. The particular means of explosion consisted of a hollow lump of iron, filled with a charge of dynamite. It was rubbed over with coal tar and dust, and exactly resembled a large lump of coal. I am not sure whether it was used with success, but it certainly was used by the Confederates. Every one here present probably remembers a case of a criminal attempt of the kind made by a German at Hamburg, who, wishing to obtain the insurance money for a vessel, made provision for putting a coal of this kind into a ship, knowing that whenever it was thrown into the furnace an explosion would take place, and the ship would be destroyed.

A most important development of torpedo science, which attracts little notice (probably because the experiments are conducted in secret), is likely to take a foremost place in the next war. I mean such submarine vessels as David Busnell or Robert Fulton devised eighty years ago, and were successfully used by the Confederates in the American Civil War. Those who wish to inform themselves upon the subject will find ample details in Lieutenant-Commander Barnes's work, and in Renard's "*Fond de la Mer*." Elsewhere Barnes tells us that the "David" submarine boat, which destroyed the United States ship "Housatonic," was manned by a crew of nine men, eight of whom worked the propeller by hand, the ninth steered the boat and regulated her movements under water. She could be submerged at pleasure to any depth, or could be propelled on the surface. In smooth water she could be exactly controlled, as her speed was about four knots.

In Renard's "*Fond de la Mer*" we hear that Spain in 1862 built a submarine vessel called the "Ictineo," which was perfectly successful in submarine navigation. Her peculiarity was an apparatus for renewing the oxygen when exhausted. She worked as well at a depth of nine fathoms as at the surface, and remained five hours under water. The French submarine ship "*Plongeur*" was worked by compressed air, and was "completely successful except as to "stability." The purpose of these vessels is to use torpedoes unobserved.

The humanity of the present day then has provided these wholesale ways of shortening human sorrows. You may be sent to the bottom by a torpedo, or blown to the sky by a submarine mine. Has it done no more? Wheaton, the American jurist, informs us that "it seems "to be thought that a steam vessel *on the defensive* may throw steam "or boiling water." The assertion is not in a very positive tone, and is confined to the defensive.

May ships on the offensive boil their enemies alive?

We seem here to have got pretty far in the way of what used to be thought illegitimate warfare. Has science done no more?

"Beneath the lower depth a lower depth appears."

In the *Nautical Magazine* for last month I found, among patents for inventions, "No. 4355. Carl Böhm, improvements in apparatus for "discharging petroleum, or other hydro-carbon fluids from torpedo "boats, or other vessels." Discharging liquid fire that is.

The patent is for "improvements," so the invention is not new. Some very illiberal lines on Sir W. Congreve, the inventor of Congreve rockets, after his death ran,

"At his old vocation the worthy knight  
Had laboured long and well,  
And perfected his instruments  
In the crucibles of —"

a very hot place. Mr. Carl Böhm might learn something there of the merits of hydro-carbon. We need not go further in following the march of civilisation. Have we not got near the limits which the laws and customs of war impose?

A few words on fire-ships, an invention for which the present age is not responsible.

It was a savage mode of warfare, but limited by a conventional custom. As it was said of the Russian Empire some years ago, that it was a despotism tempered by assassination, so it may be said of the use of fire-ships, that it was a cruel practice, but tempered by hanging their crews, if caught. I need not trace back the origin of fire-ships, like old Falkiner, who tells us they were used by the Rhodians 190 B.C., and it would be hard to prove they were not. Certainly they were used by the Greeks, with their famous Greek fire. It is more to the purpose that they first appear in our Navy List in 1675.

About this time, in a list of ships in commission, given in an old book, "Sea Laws," in this Institution, there is an abstract of our sea-going ships on December 18, 1668, giving first and second rates, none; third and fourth, 46; fifth rate, 2; bomber, 1; and fire-ships, 26.

Old Pepys tells us, with reference to our preparations for war with the Dutch in 1686:—" 'Tis a little odd to see almost half as many fire-ships as men-of-war in this fleet."

The fire-ships proved effective in the Dutch and French wars at the close of that century, but seem to have gradually fallen into disuse in the 18th. Still we find the expedition under Hawke and General Sir John Mordaunt against Rochefort, 1757, attended by two fire-ships; that of Boscawen's, two years later, also. In 1779, Lord Howe's fleet in North America, we read, was strengthened by two fire-ships; and lastly, when the French and Spaniards swept the Channel with 80 sail-of-the-line in 1780, they had nine fire-ships, and Sir Charles Hardy, who could only watch them with 40 sail, had four fire-ships.

When the Revolutionary War broke out at the end of last century, neither side seems to have used fire-ships as part of a fleet; but in 1804, after the short Peace of Amiens, when Napoleon collected an army and flotilla at Boulogne, threatening invasion, Nelson used explosion ships, called catamarans, against them, with no effect.

Thus it is undeniable, on the one hand, that both England and France employed fire-ships without scruple up to this time, and it is no less undeniable that the crews of fire-ships were not considered to be entitled to quarter. This may seem to be *illogical*, yet one can understand it. In the first place, from the nature of the case, these crews could not stick to their ship to the moment of explosion, but had, after firing the fuse, to make their escape in boats. These boats, as they passed through the enemy's lines, would naturally become targets; and if, meanwhile, some ship, clasped in the deadly embrace of the fire-ship, had exploded, it is all the more likely that the fugitives should be the objects of unsparing vengeance. Probably, too, the vague but fatal epithet of "un-English" came to attach to men who used a deadly weapon, but withdrew themselves (sometimes too quickly) from the fray. I cannot produce evidence of the facts, but I believe that Officers serving in fire-ships did not stand high with their brother Officers. It is some confirmation of this creed, that we do not find the Boscawens, Rodneys, Howes, Jervises, Nelsons, serving in fire-ships.



Of course, the idea of being hanged like a criminal would have its effects; and then, on the last occasion of our using fire-ships in the ill-managed expedition in Basque Roads, Lord Dundonald tells us that, of 20 fire-ships employed on that occasion, 4 only reached the enemy's positions *at all*, and *not one took effect!* Why not, when a squadron of line-of-battle ships is easily visible, even at night? Evidently because the crews quitted their ships too soon. But why did they do so? Were the veterans of that day afraid to approach an enemy even in the darkness? The official correspondence given by Lord Dundonald establishes the fact, that with the French, as well as with ourselves, the crews of fire-ships did not expect quarter. That fact was admitted, even by Lord Dundonald, to be a strong reason against the proposed operations which Admiral Gambier, in his letter to the Admiralty, *deprecates* as being a "horrible mode of warfare." Writing to Lord Mulgrave, First Lord of the Admiralty, he says:—"The enemy's ships lie much exposed to the operation of fire-ships. It is a *horrible* mode of warfare, and the attempt hazardous, if not desperate." It may be said that Gambier was a man likely to take a weak and unmilitary view of such matters. But then Lord Cochrane was the very reverse—a perfect fire-eater—what says he? He tells us, Vol. I, page 303:—"Other Officers had been consulted, who disapproved of the use of fire-ships." And further on:—"My reply to Lord Mulgrave, therefore, was, that the opinion of Lord Gambier, and of the naval Officers consulted by the Admiralty, *as to the use of fire-ships*, coincided with my own; for if any such attempts were made upon the squadron, the result would in all probability be, that the fire-ships would be boarded by the numerous row-boats on guard, *the crews murdered*, and the fire-ship turned in a harmless direction." By "murdered," Lord Dundonald means put to the sword according to the usual practice. Elsewhere we find (page 362) that Lord Gambier had denounced the operation as a "horrible and anti-Christian mode of warfare."

The expedition was, as all know, a failure, though the whole French squadron ought to have been destroyed; the main cause of failure seems to have been the hurry of the fire-ships' crews to quit their vessels, presumably from a dislike to be slaughtered.

The inference I draw from this is—first, that such a rule, the rule of giving no quarter to the crews of fire-ships, worked well in practice; secondly, that it might be applied to some other cases, without really incurring the charge of barbarity.

But some may say, "What, not barbarous to kill prisoners in cold blood?"

In the case just cited, I find nothing of such killing in cold blood, for the fire-ship crews seem to have taken very good care of themselves; whereas, had they taken their ships close to the enemy, there would probably have been a slaughter, that is, a burning alive of several thousand.

Of course, it is our object in war to destroy our enemy; but Lord Dundonald, a most competent authority, tells us this could and would have been done after the failure of the fire-ships, but for the peculiar



character of Gambier and the unhappy jealousies of the British fleet.

It would of course be a very serious thing now, in the 28th year of the millennium, to practise severity to prisoners, even by refusing quarter. But is that really cruel which saves life, or, at worst, kills units to save thousands. How do you treat spies? and why do you do so?

For it is not in either case an act of revenge, it is done on the principle that against exceptional means of attack you must use exceptional means of defence, and that both reason and experience tell you that those means will be successful.

Take this illustration. The Captain of the "Excellent" desires to try some new infernal machine against a target hulk. It requires the nicest adjustment; and, calling the carpenter, he says, "Mr. Chips, you will go in that boat, taking this machine with you, and you will fix it in such a manner." Well, Mr. Chips fixes it to a hair's breadth. But would he have done it equally well had the Captain added, "But take care how you use your tools, for if you are heard, you are hanged?"

"Horrible suggestion!" some may say, and quite contrary to laws of war, quite indefensible, morally and logically.

Well, I will put the logical argument against it in the form our French friends are so fond of. "Of two things, one. Either such weapons are legitimate, and then you cannot punish those who employ them, or they are *illegitimate*, and you should not use them yourself." Now this is a very pretty dilemma with a very sharp pair of horns; and I am asked, "Which will you choose?" I might answer, "Neither! Your new mode of warfare may be legitimate; what is more, I must practise it if *you* do; but I object to it, and the higher law of self-preservation compels me to treat the practice with severity."

Of course, to put herself right, England would have to offer to relinquish the practice, if the other Powers would do the same. But this they would refuse, because they took to the new weapons to destroy our maritime supremacy. As regards some supposed prohibition of such severity by the law of nations, where do we find it? Or, to go deeper, is there any *fixed* "law of nations" as applicable to a state of warfare?

In the same sense that we talk of the laws of England or of any other country there is no law of nations. Roughly speaking, we attach to the word laws three necessary conditions. Some recognised source to enact them; some authorised court to decide upon alleged infractions; and, above all, some power to enforce those decisions. All these three conditions are wanting to the law of nations. Failing this last requisite the others are useless, and it is just there, that what is called international law breaks down in war-time, when *inter arma silent leges*. We might see an illustration of this weakness in Canning's amusing lines on the Revolutionary French Consul put to death by the Dey of Algiers.

We are told that:—

"The Consul quoted Bynkershoek,  
 And Puffendorff, and Grotius,  
 And proved from Vattel  
 Exceedingly well,  
 That to do so would be quite atrocious.  
 'Twould have set a Christian weeping  
 To have heard the doubts he stated.  
 But the Moors did as they were bid,  
 And strangled him while he prated."

Here all his learning could not save him, because it wanted what the jurists call a "sanction," a power to enforce it. He had the powder but not the shot.

The Dey, of course, was a barbarian, and knew no law save his own will, but, in a civilised way, strong Powers imitate him in the present day.

A French witty infidel of the last century said that "Providence" always sided with the big battalions." Our own history affords many glorious exceptions. But, had Voltaire said that international law in war-time was always interpreted in favour of the big battalions, he would have come near the mark, and I don't see how it can be otherwise.

The great "Publicists," or writers on international law, are self-commissioned. They differ as to their own origin and office; they differ about fundamental principles, and differ on plain questions of morality where mankind are generally agreed. Some of the old jurists of the highest authority justify assassination and poisoning. Wheaton, a standard American authority, tells us:—"Even such "institutionary writers as Bynkershoek or Wolf, who lived in the "most learned and not the least civilised countries of Europe, at the "commencement of the 18th century, assert the broad principle "that everything done against an enemy is lawful that he may be "destroyed though unarmed and helpless, that fraud or even poison "may be employed against him, and that an unlimited right is acquired "by the victor to his person and property. Such, however," he goes on to say, "was not the sentiment and practice of enlightened "Europe at the time they wrote, since Grotius had long before inculcated a more humane principle."

But, hear what Grotius, this same Grotius (whose real name De Quincey tells us was Van Groot), tells us Puffendorf says:—"It may, "in the next place, be particularly enquired whether it be lawful to "assassinate an enemy? And here Grotius or Van Groot thinks "that there ought to be a distinction made between persons who "violate their faith expressly or tacitly given, as soldiers, subjects, "vassals, refugees, or persons that were never bound by faith, and "that to employ the latter is *what no law forbids*. But to make use of "those, who, by the act must be guilty of falsehood or treason, is "what the more civilised part of mankind always look upon as the "greatest infamy or baseness"!!!

So it would seem that to employ the Heathen Chinese, the Malay Pirate, or a maniac to assassinate your enemy's General is quite justifiable. To adopt the style of a well-known preacher, "Oh, Van

"Groot, Van Groot, who taught you this vile morality?" Puffendorff does not concur in this. But *Vattel* allows assassination.

Coming to modern writers on international law, though in my researches for some definite rules as to what is legitimate in warfare or what is not I was disappointed, I found some very puerile prohibitions and some which showed ignorance of the subject.

John Heffler, writing in 1873, "*Le Droit International*," page 241, says:—"The laws of humanity forbid, also, using means of destruction which, at a single blow by mechanical means, beat down whole masses, reducing man to the rôle of an inert being, or uselessly increasing bloodshed. Let us cite the use of star shot (*boulets rainés*) in land battles, or '*couronnes foudroyantes*' in naval battles, projectiles which destroy whole ships with their crash."

Telübad, in "*Droit des Gens de l'Europe Moderne*," objects to chain and bar shot, and says it is also forbidden to load muskets with two balls!

But the fact is, we must not look to the jurists for anything more than general principles in the laws of war. It is not their function to make or to mend those laws. They are often made for the occasion by the Commanders on the stronger side.

Thus, our countryman, Montague Bernard, says in a very remarkable passage:—"The student of history is apt to be a little puzzled by frequent reference to '*laws*' with which he is tacitly assumed to be familiar. The Duke of Wellington directs that a French garrison shall be decimated and all the Officers put to the sword if it should violate the '*laws of war*,' by destroying works which it cannot maintain. The laws of war forbid the defence of an unfortified town. They permit a ship to hoist false colours at sea though not to fire under them; they do not prohibit bribery or intrigue. What are these laws? Where are they written? What authority do they command? They are a body of *usages*, for the most part conditional, which have arisen principally from motives of convenience or the extension of commerce."

I am bound to say here, that the distinguished writer of this passage informs me that he by no means meant to refer to this order as a precedent or authority. But we have the fact that the Duke gave the order to a Spanish Officer, who was at a distance, and who would have felt no compunction in executing it.

Napier, indeed, doubts whether the threat would have been acted on, and thinks it *ought* not as regards at least the private soldiers who were irresponsible, but that supposing escape impossible, the Officers might have been executed. Were not the inferior Officers, however, as irresponsible as the soldier? Modern jurists, I believe, deny the right of refusal threatened.

The Duke of Wellington was a man who knew his own mind, and if ever he wrote a letter free from a shadow of vacillation, it was that stern command to inflict the punishment *without awaiting any further orders*.

Are we then to admit that the Duke, on so momentous an occasion, while invoking the laws of war, not only violated them himself, but



outraged the precepts of humanity? I cannot admit it! I believe the explanation to be simple.

It was a *Spanish* force, commanded by a Spanish Officer, that blockaded Pampeluna, and the French garrison had obtained possession, by the basest military treachery, in *peace-time*, and in violation of all law and principle. It was as clear an act of brigandage as the seizure of Dover Castle this day, by French soldiers disguised as "excursionists," could be. The Spaniards, therefore, had a right, in any case, to treat the garrisons as pirates, but this right became doubly strong under the circumstances contemplated in the Duke's letters. (See Wellington Dispatches, Vol. XI, p. 210.)

But why do I dwell upon this episode? Because it seems to show that acts of war are best judged by the Commanders who have the facts before them, and that even in this extreme case, apparent severity was not real inhumanity. I believe that stern letter not only saved lives on that occasion, but that the lesson was probably remembered in 1870, and may have saved lives then.

But it is vain to think that the rough game of war ever was or ever will be played in exact conformity with the rules of the jurists. The war of 1870 produced many infractions of the law of nations, if we may believe M. Calvo. He cites several, which time will not allow me to quote. The French, as the weaker party, complained, but in every case the Court of Big Battalions decided against them, and what was worse, when that Court sent in its little bill, it proved to be just five thousand millions of francs!

Think what a torpedo of a bill! How many six-and-eight-pences must have gone to make it up?

To remedy the many defects of international law, a Conference met at Brussels in 1874, when we are told that Prince Gortchakoff sent a programme of seventy-one Articles, *covering the whole ground* of the usages of war, in itself forming, as Prince Gortchakoff said, only a starting point for ulterior deliberation. It soon appeared, however, to the British Commissioner, to be a Conference in which the wolves offered little more to the lambs than a voice in preparing the mint-sauce with which they were to be eaten.

Æsop would have described this Conference in some terms like this:—"The wolves of a great northern forest invited the sheep of "neighbouring pastures to a Conference, upon the most humane "method of carrying on war. The chief Commissioner, a venerable "wolf, having dwelt on the pacific temper and humanity of the "wolves, deploring the sad necessities which at times forced them "into war, stated his complaint against the sheep.

"Instead of adopting any recognised military formation on the "approach of the wolves, the sheep, he said, rushed together in a "tumultuous manner, forming what was neither line nor square, but "a shapeless crowd, faces inwards and sterns outwards, which (to "say nothing of its unbecoming or unmilitary effect) made it impos- "sible for the wolves to select the fattest sheep or the tenderest "lambs, as was their undoubted right, and, what grieved their hearts, "made it necessary to be rough with scraggy or elderly ewes.



"To this the spokesman of the sheep, an elderly bell wether, replied, that for his Excellency's kind intentions the sheep were much obliged, and to his assurances of wolfish humanity, they could only answer 'bah.' That the sheep were a simple folk, knowing little of war, and having, in truth, only two recognised manœuvres. The 'strategic movement to the rear' (always executed in double-quick time) and the formation of which his Excellency complained. 'Faces inwards, sterns outwards,' that it was not, he believed, a manœuvre recognised at head-quarters, either in St. Petersburg or Berlin, nor was it practised by the British Guards on parade. But it suited the ovine genius, because those in the centre of the formation were safe, and those outside could not see the danger, which agreed with the ovine constitution.

"That for the rest he must only say 'bah!'"

We cannot then look to a Conference to decide.

It will, I imagine, fall to our Admirals and Commanders in the next war to decide this question. When they come to do so I hope it will be unbiassed by any mere phrase. Bismarck said "The French were at all times under the dominion of four phrases," and we at times fall under a similar yoke. I object, in a matter of this kind, to the phrase "murdering prisoners in cold blood." It is begging the whole question to call it murder, for we are all agreed that murder is an objectionable practice, and it is inaccurate in every word. An enemy is not a "prisoner" unless you make him so, and the expression "cold blood" is utterly inapplicable to the circumstances assumed.

For how would the case arise in actual practice? We will assume that a submarine torpedo-boat has just succeeded in blowing up a ship and her 600 souls in sight of our fleet. Those who have just witnessed the catastrophe, and know that it involved the death of many fast friends, will hardly be in that frame of mind called "cold-blooded." Well, every eye is on the stretch to discover the doers of that deed, and the submarine boat—crippled by such an accident as constitutes the only danger—emerges on the surface. The fire of every ship concentrates upon that boat, the guns' crews not in the coldest mood. Shall the order to "cease firing" be given, and shall those who have just sent 600 brave souls to a watery grave be sent back to reap their rich reward, and encourage others to emulate the deed? That is the question as it would present itself. I see no murder and no cold blood, but a stern law of retribution, older than any jurist's theory. I believe that law to be just, I know it to be for the welfare of England, and the Poet tells us—

"Britons rarely swerve  
From law however stern that tends their strength to nerve."

Major E. H. CAMERON, R.A. : Such a subtle and delicate vein of satire has pervaded Lord Dunsany's discourse that I really do not know at this moment whether he is in favour of or against the use of torpedoes and other such implements of warfare. He, certainly, it did seem to me, at one period of his lecture, glanced rather strikingly at those who discharge torpedoes, as doing so from a position of perfect safety. Instead of that being the case, I think I may say that anybody engaged in torpedo service may go forth very well assured that he is going on a service of the

most extreme danger, if not on an absolutely forlorn hope. The noble lecturer instanced the "David," and I thank him for that instance; for if my memory serves me right, the crew of the "David" went to the bottom together with the last ship which she destroyed, and they sleep the sleep of brave men who died in the defence of their country. He has also instanced explosive coal lumps, and, I think, gives the credit of that, or the discredit, to the Confederates. I can only say I have had one of those lumps in my own hands which came from the Northern side, and was intended by Northern cruisers to have been put on board blockade runners who were to have been allowed to proceed on their mission, to discharge their cargo into the bunkers of Confederate cruisers, and thus the explosive coal lump was to have produced its unhappy result when least expected. Then the noble lecturer said something about modern barbarity and the barbarity introduced by science; but how about molten lead poured from machicoulis upon the heads of the knights of old; and not only upon the knights protected by their tin pots, but on the unarmoured yeomen who came to storm the castle! With your permission I would quote something from a lecture delivered in this Institution by Major Fosberry, on a kindred subject: "Have we not heard that in the dark ages humanity beat out men's brains with a mace, whilst cruelty used the lance, the sword, or the arrow, and that the bishops of the period therefore rode into action with the mace, so as to kill without shedding blood?" That was the nice distinction drawn in the dark ages. Then, Sir, the noble lecturer said, "What will be said as to torpedoing English channels or harbours by the enemy during the night?" Well, I suppose we must, as the Americans say, sleep with our "eyes skinned," and no doubt it is the early bird that gets the worm; and if the enemy gets in, he can torpedo the harbour with perfect safety if he is not found out. Some years ago, in deference to the wishes of a foreign Power, whom, perhaps, now we are not so anxious to conciliate, we abandoned the use of explosive bullets; and now, mark the irony of history. True, we have abandoned them, and with them the possibility of blowing up our enemies limbers with great certainty. But what have we introduced instead? We have the Armstrong segment shell which, I venture to say, produces a far worse wound, and which is now happily dropping into disuse, and we have the Martini-Henry rifle which produces an equally severe wound, which is now happily in full vogue. Fire-ships, I think, must be dismissed from consideration as our ships of war are, from the outside, practically unflammable. In conclusion, I would say, "Save us from the cruel mercies of the weak." War—that splendid mistress for whose favours we have all longed since we reached man's estate—must be given her full attributes and painted in her most deadly colours, in order that the curses which, undoubtedly, she brings to the majority of the population may extend over as short a period as possible. Let us make her as deadly as we can in the name of humanity and of every good feeling.

MR. C. BÖHM: I have listened with great interest to the noble lecturer's instructive words, and I hope that we shall all be benefited hereafter by what he has said. His Lordship, however, referred to me in the course of his lecture as the inventor of the Greek-fire torpedo boats; and being anxious that no stigma or imputation should rest on my character, and on that of those who have been associated with me in establishing the manufacture of Greek-fire torpedo boats in this country, I mean Messrs. Wigzell, Halsey, and Co., I ask your permission to read a few passages from a pamphlet which we have published on this subject: "And to our critics generally, who may be inclined to argue that our Greek-fire apparatus cannot be regarded as a 'fair' weapon, we say, You manufacture and employ guns capable of throwing from a safe distance of 4,000 to 5,000 yards shells weighing several hundredweight filled with still more inflammable and destructive compounds than petroleum, and yet you wish the world to believe that the ships armed with our Greek-fire apparatus take you unfairly at a disadvantage; whereas, in point of fact, if anything, it is you who are making use of unfair weapons, for our apparatus is perfectly inoffensive at a distance of two or three hundred yards, and therefore those crews who are using our machine must exhibit more martial, heroic, and self-sacrificing qualities than your crews, who are armed with guns capable of smashing to atoms from a safe distance of 4,000 to 5,000 yards our apparatus and the crews in

"attendance on it." I am not an Englishman by birth, but I have lived here for many years; and to all intents and purposes I am an Englishman. This pamphlet was written by me, and is endorsed by Messrs. Wigzell, Halsey, and Co., and as the words I put into their mouths express also my feelings, I crave the liberty to give you the concluding sentences of our pamphlet: "We repeat it with emphasis, on patriotic grounds, and for the sake of our brave and heroic 'tars,' whom we do not wish to see paralysed in their gallant naval combats just at the moment when victory is within their grasp, that we shall be glad if a few days after the publication of this pamphlet adequate and proper antidotes be discovered and adopted into the service by our naval authorities, and we can only add that our pleasure will be increased if they keep the secret of such antidotes to themselves. It is, however, generally known, that great scientific and inventive minds have unsuccessfully endeavoured for many years, since the Abergele railway accident, the conflagrations at Bordeaux, Antwerp, &c., &c., to discover efficient antidotes against the disastrous effect of burning crude petroleum, when spread over a large area. Of course, we and the readers of our pamphlet are perfectly well acquainted with the capacities of the smothering process, and of the various patented and unpatented fire-extinguishing compounds, but as we know also that their application is impossible, impracticable, and useless when the deck and sides of the ship become suddenly covered with a sheet of fierce and vehement fire and flame within a few seconds, we make an earnest appeal to the authorities, and to the inventive and scientific genius of our countrymen to seek for practical antidotes, though it does not require much imagination to conclude that the discovery of an antidote, which would be suitable and practicable under the conditions which must be anticipated in actual warfare, would be accompanied also by a heavy pecuniary loss to our firm, but we say with deliberation,—perish the money interests of our firm if only British supremacy be maintained over the seas of the world."

Admiral VESEY HAMILTON: I have listened with the very greatest pleasure to the lecture delivered by Lord Dunsany, in which a great number of new and interesting facts have been brought before us. I must say I have also listened to it with very great surprise; for it is the first time in my life that I have heard the question of the legality of the use of torpedoes discussed. I have always hitherto considered torpedoes as much an article of legitimate warfare as shot, shell, or any other way by which we destroy our enemies. I am not connected with the Gunnery or Torpedo School; but should I be appointed in case of war to any position of trust, I can only say I should use torpedoes myself, and should expect my enemies to use them, and of course, as Major Cameron said, we must "keep our eyes skinned" to avoid them. There is one thing in which I think we, as Englishmen, gain by the introduction of torpedoes, and that is in the defence of our numerous harbours. We may erect forts; but I have no hesitation in saying that wherever there is a free course for steam ships no artillery can keep those ships out. The use of artillery is to destroy ships when they are brought up under some obstruction, whether torpedoes or a boom; but Admirals Farragut and Porter proved in the Mississippi that no amount of artillery power would prevent ships from passing forts. Therefore, I say, without the use of torpedoes, our harbours are defenceless before the attacks of any privateers who choose to come. There is another fact which we must consider in dealing with this question, and that is that we should find if torpedoes did not come into use, that the naval actions of the future would be decided by ramming, for owing to the rapid changes of distance between two antagonistic ships you would scarcely ever find that a shot would hit. The result would be that the two ships running at one another, if both were handled with equal nerve and pluck, both must go down. Now, by the use of torpedoes, although your enemy may go down as the result of a torpedo which you send, it would have no such disastrous effect upon your own ship; therefore the result will be that actions in future in naval warfare will be fought much more cautiously than they would be before the introduction of torpedoes. Lord Dunsany has also given us a good deal of international law. Now, I am rather inclined to think that this international law works for our disadvantage, and had better be left alone by naval Officers. During the American War there was one case where international law came in, and that was when Wilkes took Mason and Slidell out of the "Trent," pleading in justification various authorities in inter-



national law. Whether his international law was right or wrong I do not know; but when America saw that England was determined, those men were given up. Amongst the numerous complaints made by the Americans against the English during their Civil War there was not a single charge made against the Navy. The officers used common sense, and I think, as a rule, that common sense comes before international law. On the question of torpedoes, I see a gallant Torpedo Officer present who may, perhaps, take up the cudgels and defend his own case. I have only reason to express my surprise at their being considered at all illegal.

The Right Honourable MONTAGUE BERNARD: I must apologise for rising to speak upon the subject when there are so many present who are more competent than I am to do so. However, Lord Dunsany has done me the honour of referring in his observations to an essay of mine written nearly a quarter of a century ago. I should like to say one word with reference to what has fallen from Lord Dunsany. Perhaps he will allow me to say, as a civilian, that I am extremely obliged to him for what he has been good enough to tell us. I have derived great instruction from it, and it has been extremely interesting to me, as it no doubt has been to persons more concerned in the matter than I can be. The best way to treat international lawyers is to treat them as what they really are; that is to say, as persons whose business it is not to make laws on these subjects, because, as Lord Dunsany has told us, these laws are really made by practice, that is to say, by soldiers and sailors, by Generals and Admirals, and by their Governments, and not by persons sitting in their studies. But a useful service sometimes may be done by a person who sits in his study, and endeavours to do what soldiers and sailors cannot; that is to examine and collect the various usages which are in force, and inform others what those usages are. The laws of war are nothing at all but the usages according to which warfare by land and sea is carried on. If anybody denies that such usages exist, I think he can neither have seen anything of war nor have read anything about it. A naval Officer commanding a vessel engaged in war would not hesitate to use a neutral flag in approaching an enemy's ship; but nothing would induce him to fire into his enemy before hauling down the neutral flag. Why is that? Because usage permits you to use a neutral flag in approaching an adversary, while, on the other hand, it is a definite and distinct rule that you must not fire into him until you have raised your own colours. The collection of the whole body of usages—and they are not so many as people suppose—represents what we call the laws of war. Lord Dunsany referred to a passage I had quoted from the Duke of Wellington's despatches, in which the Duke wrote to Don Carlos d'España, who was besieging Pamplona, ordering him to decimate the French garrison should they destroy the fortifications when their relief had become clearly hopeless. The Duke of Wellington supposed in that case, not that he was about to commit an act in opposition to the laws of war, but that he was actually enforcing a particular rule or law of war that existed in his time. Perhaps Lord Dunsany did less than justice to two eminent persons to whom he referred as having given an opinion as to a question that arose in the French War, for I think he quoted Messrs. Calvo and Heffter as being Frenchmen. The fact is, that one of those jurists is a Spanish American and the other is a German.

Lord DUNSANY: I did not mean to say that Heffter was on the French side. It was Calvo from whom I have some very long quotations, although I did not read them.

Mr. MONTAGUE BERNARD: I thought your Lordship spoke of Heffter as a French authority, but doubtless I was mistaken. His book is translated into French; but he wrote in German. On the main point I really feel this, and you will permit me, though a civilian, to say so. It is of material consequence that we should maintain firmly the distinction between what is fair warfare and what is not fair warfare. If you allow a particular mode of warfare to be fair and legitimate, and at the same time say that you will cut the throats of the persons who are engaged in it when you get hold of them, then I say you destroy and confuse that distinction. Do let us bear in mind that there are fair modes of carrying on war, and that there are unfair modes. Poisoning a well is not considered a fair mode of carrying on war, nor is the sending an unscrupulous person to assassinate a Commander-in-Chief. For my part I confess that the sending an infernal machine that looks like a mere



piece of coal into an enemy's country is worse to my mind than even poisoning an enemy's Officer, because you cannot foresee what destruction it may cause, or who may be the sufferers. I can conceive nothing that falls more thoroughly within the description of an unfair mode of warfare than that. There are permitted acts, no doubt, that very nearly approach the line. If, in the disguise of a neutral, you come as close to a hostile ship as you can, then suddenly haul down your flag and fire a broadside, that is getting very closely to the prohibited line; still it is not prohibited, and since that is known you have to be on your guard against it. Lord Dunsany referred to the practice of hanging spies. Now, if any man goes into an enemy's lines in uniform and is taken prisoner, every one knows he is not hung; but if he goes in a smock frock or a blouse, and pretends to be a civilian, while all the time he is a soldier, he may be hung; and if a civilian goes and pretends to be engaged in no hostile business, whilst all the time he is engaged in a most mischievous operation of war, that of gaining information about the numbers and positions of an enemy, the practice of war is to hang him likewise. Why? Because each of them is making use of the dress and appearance of peace in order to carry on a hostile operation; and unless you prevent that by measures of severity it would be impossible to distinguish between those who were at peace and those who were at war, and you would have to adopt severities of a much wider and more oppressive kind. I venture therefore to say that you should not, simply on the ground that in these cases you have immense destruction wrought with small means—I do not say with small risk, because the risk is generally great—if the means themselves are recognised as fair, think of hanging the men when caught, or refusing them quarter. As to the practice of laying down torpedoes at the entrances to harbours and the like, no doubt there is this to be considered. You ought to be careful how you use means which may take effect, not only against combatants, but also against non-combatants. The laying down of a torpedo at the entrance to a commercial port, everybody, I should think, would condemn, even if there happened to be in that commercial port an enemy's ship of war likely to come out. In this matter I do not know that any absolute rule can be laid down. You have to do your best to attack and destroy your enemy; but our Officers, in the bombardment of towns, and other like operations, have never failed to follow one rule, that is, to avoid, as far as possible, the destruction of non-combatants. That is the practice we pursued in the Russian War and everywhere else, and that, no doubt, is a thing always to be borne in mind. Beyond that, I do not know that there is really much to be said. I hope that Lord Dunsany will pardon me for offering these criticisms upon his interesting paper.

**THE CHAIRMAN:** We have a Torpedo Officer present who has been referred to. We shall be very glad to hear anything he may have to say.

**Commander ARTHUR WILSON, R.N.:** I came here, Sir, simply to listen to what was going to be said against torpedo warfare, but I do not think I have any remarks to offer upon the subject.

**THE CHAIRMAN:** If you have heard anything against it, perhaps you can say something in its defence.

**Commander WILSON:** I hardly know exactly the line that the argument has taken. However, I may state this: it is a kind of warfare that has been in use in every country of which I have known anything since 1853. It was used against us in the Russian War: it was used in the American War; it was used in the wars of the South American Republics; it was used in the war between Austria and Italy for the defence of Venice: it was certainly used for the defence of German harbours during the Franco-German War; and it has also been used in the present war which has just come to a close. After a weapon has been so used for so long a time, there can be no pretence for saying that it is unfair. As to the methods of dealing with people who lead attacks in torpedo-boats, that, I think, must be left to the Commander-in-Chief at the time. For my own part I do not know of any precedent for saying that a man who leads a torpedo attack should be hung. If a man does attempt to attack in an out-rigger torpedo-boat, and so on, of course he must take his chance of being shot if taken red-handed in the act. For my own part I look upon a person in a torpedo-boat attacking a ship very much as a soldier in a rifle-pit. If you see a soldier in a rifle-pit with his rifle pointed towards you, you are not

likely to give him much quarter, at all events until he drops his rifle. In the same way, as long as the person in the torpedo-boat has his weapon, which he can use with effect, you are not likely to give him any quarter. It is not likely when you storm rifle-pits, and half your men are shot down, that you will be at all merciful to the men in the pits at the time; but if you take a torpedo-boat, and then, some time afterwards, when you have had time to cool, you talk of hanging the crew, I think that is not according to the rules of civilised war.

Major CAMERON: May I be allowed to add a word or two? Lord Dunsany referred to the Thorneycroft launches. I think he rather stole a march on us when he spoke of their attaining thirty knots speed. It may, however, be satisfactory to those who are not behind the scenes to know that on board the "Excellent," and also in Woolwich Arsenal, means are being taken for providing mitrailleuses with steel bullets, which will penetrate these torpedo-boats at 200 yards and upwards. That, I think, will make the interior of such torpedo-boats uncommonly hot for the Officers and crew.

Commander GILMORE, R.N.: Lord Dunsany has touched upon torpedoes—can there be aerial as well as submarine torpedoes? Many years ago, when Venice was blockaded by the Austrian fleet, a paddle steamer called the "Vesuvio" had a sort of inverted parachute fitted on the poop; in this parachute balloons were inflated, to which were suspended huge shells. When the wind blew on the land the balloon and shell were sent up; to the balloon was attached a bag of powder and a slow match, the match calculated to ignite the powder when the balloon was over Venice. The match exploded the powder, which blew up the balloon and ignited the fuse of the released shell, which came whirling down. Several of the shells fell in the channel, though none, I think, ever got near Venice itself.

Colonel COLOMB, R.A.: I do not know whether I may make one observation? I unfortunately did not hear the whole of Lord Dunsany's lecture, but I heard the noble lord's remark that these destructive weapons were not exactly approved of by this country, and for a very good reason—that they would be directed against our maritime supremacy. With reference to this new development of Greek fire—or whatever else it may be called—of which we have heard, I do not know whether it has been legalised, but for my part I hope it will not be adopted by any civilised nation. I think it is the duty of this country, whilst tolerating these new destructive inventions, and using them when they are adopted, at the same time to consider whether, as they may be directed against this country, it would not be better to endeavour to discountenance them altogether. There is no doubt that as torpedoes and all these kinds of destructive weapons militate against our dominion of the seas, the principal business of this country should be to put itself on the defensive against these things. I hope the proper authorities are especially considering every proper measure to guard against the destruction of our ships by torpedoes.

Captain R. A. E. SCOTT, R.N.: I should not like the meeting to break up without saying a word with reference to the idea that the introduction of torpedoes is to militate against the power of this country. It is just the reverse, for the more destructive the weapon, the more pluck and dash is required in its use. I was speaking the other day to one gentleman largely concerned in the manufacture of torpedoes, and I said to him, "You are sending these weapons to other countries, in order that they may destroy us." "My dear sir," he said, "when they have got them, they won't be able to use them." The value of the torpedo is undoubtedly on the side of the defence; and to us, with our large mercantile fleet, as well as an immense flotilla of coasters round our shores, the torpedo will prove a most valuable weapon. Arming these vessels would enable us to send the whole of our fleet to protect our commerce by means of the torpedo. Our colonies will be enabled to defend themselves, and hence we shall have a greater superiority at sea than we have ever before enjoyed.

The CHAIRMAN: I should like to ask Lord Dunsany a question before he replies. As I gather from your Lordship's argument, you would treat with stern justice the persons employed in a torpedo-boat. I wanted to ask you this: that torpedo-boat, I presume, you send away from a vessel. Supposing subsequently you captured that vessel, in what manner would you treat the Captain or the Admiral flying his flag in the vessel from which the torpedo-boat had been sent?

LORD DUNSANY: I will only say that that is one of the innumerable difficulties that do present themselves. One sees many occasions on which a sentimental answer can be given in a moment,—“Hang him!” but when you really come to draw a distinction, it is exceedingly hard. And I can tell you more than that. Although I am not of the school of Grotius—not Grotius, he is not one of the atrocity-mongers—though I am not of the school of those who defend poisoning, I am not perfectly sure that there could not be something said in favour of poisoning wells. We have heard something about poisoning the air. The French some time ago had what they called *bullets asphyxiants*. These would have utterly poisoned a whole ship’s crew. If those missiles may be used, then it comes to this, that it is lawful to poison the air, but not lawful to poison the water. That is an exceedingly hard point to deal with, and it was rather with a view of eliciting your opinions than of expressing any of my own that I proposed to give this lecture. I should be very sorry indeed if any gentleman, more especially Mr. Bernard, who is not only a distinguished writer, but a gentleman who has efficiently served his country as a jurist, should think that I spoke of him otherwise than with the sincere respect that I feel. With regard to the Officers of the Torpedo School, I believe that they really comprise some of the flower of our services, and it would be exceedingly ungrateful on my part, having received great courtesy and hospitality from them last summer, to speak otherwise than with great respect of them. I think they are doing their duty most zealously and efficiently. I express no opinion as to whether torpedoes, taken in the sense in which we commonly use them, are illegal or not. Some gentleman understood me to say that I should hang all the people employed in torpedo-boats. I never dreamt of anything of the kind. There seems to me to be an enormous difference between refusing quarter and executing people in cold blood. The fact is, in practice there are innumerable cases which do not get into the newspapers, and which are not dwelt upon as atrocities, where simply the Commanding Officers do not say a word, and where the soldiers engaged give no quarter. I believe that was done over and over again in the Sepoy War, where I think it was just and expedient.

THE CHAIRMAN: We have only one more duty to perform. I am sure we shall all tender our best thanks to Lord Dunsany for his lecture. Whatever opinions we may have as to the manner in which the Officers using torpedoes are to be treated, we are no doubt unanimous in thanking Lord Dunsany for having so kindly brought this important subject before us.



## LECTURE.

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Friday, March 15th, 1878.

THOMAS BRASSEY, Esq., M.P., &c., &c., in the Chair.

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### SOME OF THE TRUE BASES FOR A RULE OF THE ROAD AT SEA.

By Captain P. H. COLOMB, R.N.

THE controversies as to the rule of the road at sea, and its relation to collisions, are, to many minds, a weariness and a trouble. It seems to some as if they were eternal, and that we neither arrived at satisfactory conclusions nor brought about any diminution of the number of collisions. I am so far in agreement with these persons as to think that much of the controversy has been unnecessary, and that some of it has done more harm than good. But, in the main, I am persuaded that progress has been made, and that, however difficult it may be to trace it in the records of collisions since 1866, there are fewer disasters of that kind now, than there would have been had these controversies never arisen. Some truth has been struck out of the many minds employed in the discussion, and some changes have been established by law, which can be shown to tend in the right direction.

Since Captain Brent and I, and those who acted with us, began to discuss these questions, eleven years have elapsed. In those years I have had the satisfaction of observing that the *design* of the changes which have since become law, has been altogether in the direction which our studies had led us to believe proper and judicious.

Before 1866, almost all seamen, and perhaps both the great maritime law courts, were of opinion that it was safe and judicious to advise porting the helm whenever the person in command of the ship felt himself in doubt as to the approach of another ship. The columns of the *Shipping Gazette* quite flowed with objections to the view I put forward, that the law of port helm should be abolished. The Mercantile Marine with almost one voice declared that it was not the restriction, but the extension, of that law, which was really wanted. Then Captain Brent and I published our "Law of Port Helm," in which we showed, by a direct appeal to the records of the Admiralty Court, that, out of 86 cases of collision, 54 were absolutely due to the



wrongful use of port helm, and that in 25 of these cases there had been no original risk whatever, and that only for the law, the ships would never have gone near one another at all. It was impossible to get over such an appeal to fact, and very soon the Board of Trade began to teach that port helm should be very much restricted. Then followed the well-known explanatory clauses legalizing this restriction, but of course in the teeth of the general opinion of the Mercantile Marine.

I was, and remain, sorry that a bolder policy was not pursued on this occasion; but I was, and am, bound to admit that, so far as they went, the *design* of these explanatory clauses was in the right direction.

But I saw that they might be made to go much further towards true law, than the framers of them were perhaps at first aware. The worst collisions brought about by the conflict of the "crossing" rules in Articles 12 and 14, and the "end-on" rules in Articles 11 and 13, all happened at night, and therefore depended on the side lights observed by either ship on board the other. The law properly prescribed that these lights should be so fitted that the *green* light should not show on the *port* bow, nor the *red* light on the *starboard* bow, of the ship carrying them. The explanatory clauses issued in 1868 limited the obligation to port the helm at night to those cases where each ship saw both side lights of the other. I reflected that, if the lights were fitted in accordance with the law, so that neither should show across the line of keel, no single pair of eyes could see both at the same moment, and therefore, if we once got the lights accurately fitted, the law of port helm, instead of being only restricted, as the explanatory clauses put it, would be altogether abolished at night, as it could never happen that both ships saw both side lights of the other. I accordingly took steps to put the case before those in power at the Board of Trade, and, after a time, instructions were issued nearly in accordance with my views; and at this moment few British ships show both side lights together, except at long ranges, and even then only for instants of time.<sup>1</sup> You may observe, therefore, that the appeal to fact as against port helm has almost absolutely killed that erroneous law, at least when its action was most disastrous, namely at night.

But port helm is not yet dead in the day-time. Only a few months ago I was travelling in a mail steamer at the rate of 12 knots, in broad daylight, when another very large steamer appeared on our starboard bow, steering a course exactly opposite to our own. As we neared one another, the commander of my ship—a most thoughtful and prudent officer—drew my attention to our relative positions, with the view of showing me that the masts of each ship must appear sufficiently open to the other to make any change of course on either part unnecessary. I quite agreed, but said, "The worst of it is, that we

<sup>1</sup> Thus, the "*Rosa Madalina*" reports, December 9, 1877, a "strange vessel," with which she afterwards came into collision, "showing red and green lights alternately." This is now the usual appearance when right ahead of a ship. See *Ship. Gazette*, December 13, 1877.

"cannot, under the present law, be certain that our neighbour thinks "as we do, for, after all, he may think the masts are 'nearly in line.'" I had hardly uttered the words, when the said neighbour suddenly ported across our bows! No harm came of it, or I should not be here to mention the fact; but all the elements of a collision were present except those very common ones of nervous excitement and want of presence of mind.

Yet, though port helm is "not yet quite dead," it is certainly dying. The French Government has advised our own, in perfect accordance with true progress, that Article 11—the law of port helm for sailing ships—ought to be struck out altogether; and our own Board of Trade has noted that the idea "seems worth consideration."<sup>1</sup> That rule will most probably disappear at the next revision.

In another direction the small end of a very philosophical wedge is being driven in. Ten years ago in this theatre we were advocating the principle of "warning signals" between ships approaching towards collision. Two years later, the United States Navy officially adopted the identical signals then described. There was, however, a discrepancy in the circular adopting them, which led to its withdrawal at the instance of our own Board of Trade. The principle of warning signals, expressive of an *intention* to starboard, or to port,—which was the "true base" I contended for,—is now admitted, and we are, I understand, to have a set of warning signals by sound, which may be made most useful so far as they go. At the next revision of the rule of the road, other signals will probably follow, for it is only a misapprehension of their intended use which has hitherto kept them back.<sup>2</sup>

Lastly, a restoration of the old river rule, which Captain Brent and I contended for in 1866–7, is about to take place, and if it be properly worded, and properly explained by the courts, the best results may be hoped for.

Though I cannot altogether approve of the means which have been employed to carry out these *designs*, yet on such a review of our progress, only those who still uphold a compulsory helm law, applicable to all ships, can feel much disappointment; but it has to be remembered that controversy has been the moving power, and that the views of the minority have prevailed.

If you ask how it is that this is so, I should tell you that the minority have gone to the facts, and, reasoning inductively, have shown whereabouts the "true bases for a rule of the road" lie. The work is still incomplete, inasmuch as the several designs can be better carried out, and it is quite possible to reduce the present percentage of collisions by one-half, if only these "true bases" are thoroughly investigated and embodied in law and teaching. I am here to-day simply to push the enquiry a little deeper than usual, and to disclose

<sup>1</sup> Parliamentary paper, "Rule of Road at Sea," July 23, 1874, page 41.

<sup>2</sup> The value of warning signals is so very obvious that we find ships endeavouring to get up a code of their own. The "Ocean," on December 9, 1877, deposes to "making signals with a fog-horn," to try and avoid collision with another ship in clear weather.—*Ship. Gazette*, December 14, 1877. So also the "Forest" shows a flare-up to the "Avalanche," to induce her to bear up.

one or two broad bases on which the practice of seamen ought to rest, and which, being "true bases," will, when used, reduce the numbers of collisions.

In discussing these matters my difficulty has always been to induce those interested, to go to the FACTS. There are mathematical certainties underlying all cases of collision which are never appealed to. There are records of collision cases which show that these mathematical certainties may be relied on, yet those who frame rules and teach under these rules, make no use of the instruments ready to their hands. More time is spent in discussing whether the word "shall" or the word "may" ought to stand part of a law, than was ever spent on the principle of the law itself. It results that the vaguest notions prevail about collisions at sea, and ships are looked upon, and treated, as if they were cabs.

I am about to-day to show you what would be mathematically right and mathematically wrong movements in all ordinary cases of collision in the open sea: and then I am going to show you by an appeal to recorded facts, that theoretically right movements do not, but that theoretically wrong movements do, almost invariably, accompany or precede collision. And my proposal is that we should officially and privately teach seamen to employ these right movements and eschew these wrong movements, so far that is as we can employ them under the present still imperfect law. I have had substance and facts enough to make not less than three papers on this head alone, and if my present paper should seem incomplete, it will be due only to unsuccessful compression.

When we consider the movements which it is competent to any ship to make in order to avoid collision with another, we have evidently to think of her in three different conditions, namely: as a ship under steam alone; as a ship close-hauled under sail; and as free or before the wind under sail. The behaviour of ships under sail has not been so closely investigated as that of ships under steam alone, and even the latter has by no means been completely studied; but enough has been established as to the laws which govern the path of a steam-ship when acted on by varied helm and speed, to enable me to deal pretty fully to-day with the steamer, and by inference with the sailing ship.

If a steam-ship, proceeding at speed, has her helm put over either way, her path will become a spiral, ultimately merging into a circular arc. Considering the spiral part of the arc as actually circular—which for all to-day's purposes is a just hypothesis—then we are able to say that its radius will depend upon three things:—(1) The length of the ship. (2) The helm angle. (3) The speed. The longer the ship, the greater will be the radius. The greater the helm angle up to  $45^\circ$ , the less will be the radius. The less the speed, the smaller will be the radius.

These are the laws so far as *space* is concerned, but it is evident that *time* is also involved. (1) The longer the ship, the greater will be the time of turning over a given arc. (2) The greater the helm angle up to  $45^\circ$ , the less will be the time occupied in turning over a given arc. (3) The less the speed, the greater will be the time in turning



over a given arc. We have lastly to note the relations between *time* and *space*. Thus, the increase of the helm angle up to  $45^\circ$ , though it reduces the radius of the arc, does not reduce the time of turning in so great a proportion. The decrease of speed, though it reduces the radius of the arc, does not reduce it so much as it reduces the time of turning.<sup>1</sup> Lastly, it must be noticed that the helm angle reduces the speed over the arc below that which the ship held when on a straight course.<sup>2</sup>

When we come to apply these theoretical data to practice, it is evident that we must deal with average figures. Ships vary in length, in rudder area, in helm angle, and in speed; and we cannot, therefore, assume any fixed conditions for all classes of ships. But we can do this: we can take a ship of average length and average speed, and we can see, by a reference to various experimental data, what such a ship is capable of doing. We can then express her capacities in terms of her length, both as to space and time, and then we can say that to any other steam-ships these figures may be reasonably applied. We shall know, in short, pretty well what any steamer *cannot do* by varying her helm and speed, though we may not be able to say so well what she can do. But I must note in passing that whatever mistake may be made in assuming these average manœuvring powers—whether we credit our ships with greater, or with less powers than they actually possess, it will not affect the scope of my argument or falsify in any respect my reasoning. We shall be dealing with two ships invariably, when we come to apply the theory practically, and whatever we assume wrongly for one ship will be corrected by a similar assumption for the other. But I shall, in any case, take a reasonable basis to work on.

<sup>1</sup> So far as I know, Vice-Admiral Sir Cooper Key was the first to formulate these fundamental laws. I find in an official report of his on experiments carried out under his supervision, and in which I had the honour of assisting, the following words:—

“February 12, 1863.

“An increased area of rudder reduces the *diameter* of the circle described; reduces the *time* of describing the first quadrant; but increases the time of completing the whole circle, on account of the vessel's way being reduced.

“An increase in the speed of the vessel increases the diameter of the circle, and decreases the time of completing it.

“All other circumstances being the same, the diameter of the circle and the time of turning are both reduced by increasing the angle of the rudder up to  $45^\circ$ .”

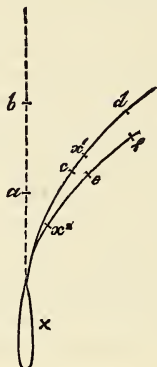
These enunciations of fact have never been questioned. The late French author, M. Lewal, however, denied that a reduced speed has any effect on the radius of the last part of the arc, which he thought was equal in the same ship at all speeds. He concluded, however, that while at 12 knots the spirality was very great indeed, it almost entirely disappeared at four knots, and the whole curve became very nearly circular. See “*Principes des Evolutions Navales*,” also numerous papers in the *Revue Maritime et Coloniale*. For English references, see my “*Modern Naval Tactics*,” *Royal United Service Journal*, 1865; my “*Attack and Defence of Fleets*,” *ibid.*, Vol. XV. See also an article in the first volume of “*Naval Science*,” “*The Theory and Practice of avoiding Collisions at Sea*.”

<sup>2</sup> The speed of the engines in a screw ship is invariably reduced by the act of putting the helm over, partly, no doubt, from the difficulty the water has of escaping after being thrown off from the screw, but more, I think, because the inertia of the ship has ceased to act in a line with the keel.



If, then, I take as an average radius of the arc described,  $2\frac{1}{2}$  times the length, I shall use a measure which is something greater than the possibilities at very low speeds, and something less than the fact at very high speeds. But then I must allow for a reduced speed being used by the ships I deal with, the law—properly, I think—enforcing such reduction. I know of no ship getting below a radius of twice her length in turning over her arc. If we suppose that she reduces her speed through the water by one-half to effect this reduction in the radius of the arc, we shall be, on the whole, using figures which have been ascertained by experiment to be reasonable.<sup>1</sup>

FIG. 1.



We are now in a position to draw a diagram illustrating the manœuvring powers of a steam-ship, which I have done in Fig. 1. Here we have the steam-ship, X, proceeding at speed towards the point *b*, from which her stem is distant two ships' lengths. If she puts her helm hard a-port, she will then, instead of going towards *b*, pass over some curve, *Xcd*, which, as I have explained, we take as the arc of a circle whose radius is  $2\frac{1}{2}$  times the length. If there were no retardation due to helm angle, the stem of X would reach the points *c* and *d* in the same time as it would have reached *a* and *b* had she kept her course. What amount of retardation must we calculate on to be reasonable? Time does not allow me now to refer to the data upon which I say that we should calculate on a reduction of speed equal to about one-third,<sup>2</sup> but upon mature consideration I place it at

<sup>1</sup> M. Lewal, from experiments with twenty-nine ships of all sizes, from a steam launch, 32 feet long, to the "Achilles," of 380 feet, found that the average radius was 3.15 times the length. The speed varied from 12 knots to 3.2 knots. The least recorded radius was with a gun-boat and a specially enlarged rudder at the speed of 3.2 knots, and she gave a radius of 2.5 lengths for her arc (see "Principes," page 11). The "Achilles," "Warrior," "Bellerophon," and "Lord Clyde," at 12 knots described arcs whose radius averaged 2.4 times the average length. At 5 knots the same ships averaged 2.2 times their length. See Reed, "Our Ironclad Ships," pp. 179, 181.

<sup>2</sup> The data, such as it is, may, however, be given in the following note :—Sir Coope Key found that when a gunboat with a large area of rudder had her helm put har

that figure. The result of this retardation, when reduced to diagram, is that *X* will only reach the point *x'* with her helm a-port, in the time it would have taken her to reach *b* had she continued her course. A similar result necessarily accompanies the action of starboard helm.

We have allowed that if the ship, *X*, can turn along the curve *Xcd* by the simple action of her helm, she has a certain power of reducing the radius of her arc by reduction of speed. We can hardly, in the face of experiments, expect to get over the reduced arc by a less reduction of speed than one-half of whatever it was normally, so that if the stem of *X* would reach the point *b* in any given time with the helm amidships, we cannot expect it to get farther than *x'* in the same time, under the action of the helm angle and reduced speed.

Such are the manœuvring powers of a steam-ship so far as helm, or helm and speed combined, are concerned. She has also powers—not yet placed under any general laws—of reducing and increasing her speed without altering her course, but we need not in this paper investigate them.

We can very readily infer from the laws ascertained for steamers, those which must, in a greater or less degree, govern the manœuvring powers of sailing ships. For, consider *X* as a sailing ship close-hauled on the starboard tack, and, like the steamer, putting her helm a-port to avoid collision. Then we can see that the original propelling power of the wind becomes at once reduced, while the retarding effect of the helm remains as in the steamer. These two causes would bring the stem of *X*, as a sailing ship, only to the point *x'* in the time it would have taken it to reach the point *b*, had she continued her course. It is to be observed that the curve *Xcd* is not open to *X* as a sailing ship close-hauled on the starboard tack, for that presupposes a continuance of the original motive power, which may be true of the steam-ship, but cannot be true for the sailing ship near the wind, as the propelling power of the latter begins to lessen directly the helm is put down.

If the ship *X* were a sailing ship close-hauled on the port tack, the case would evidently be different. The pressure of wind and water together is generally such as to over-balance the ship and make her tend to fly up in the wind, consequently when the helm is put “hard-up”—in the case of *X* on the port tack “hard a-port”—some of its

over, she reduced her speed over a complete turn from 7 to  $2\frac{1}{2}$  knots. It is probable that the reduction over the first part of the arc was rather less than this, while the reduction over the last part was rather more. M. Lewal has some useful remarks, but not very much data on this branch of his subject, as it is so mingled with the times occupied in putting the helm over! But he shows in one ship a reduction of 1·65 knots on 9·0 knots, helm angle only 30°. In another, 2·8 knots on a speed of 12·3 knots, helm angle 28° only, and so on. (See “Principes,” pp. 21 and 290, &c.) The “Bellerophon” reduced her speed from 12 knots with helm amidships to 7·8 knots over her arc. The “Achilles,” “Warrior,” “Bellerophon,” and “Lord Clyde,” from a mean speed of 12 knots on a straight course, reduced it to a mean speed of 8·3 knots over the arc. The same ships from a mean speed of 5 knots, reduced it to a mean speed of 4·2 over the arc.

As in laying down practical rules for avoiding collision, we must keep them well within the possibilities; it seems upon the whole that if we allow a  $2\frac{1}{2}$ -length radius, we cannot allow less than a reduction of one-third in speed.

turning power is lost at first, being already expended in keeping the ship on her course. The propelling power of the wind is, on the other hand, an increasing one as the ship goes off. If we gave less helm in a steamer and increased the speed at the same time, we should certainly get a larger arc and greater speed over it; and this is exactly what we do get in "bearing-up" under sail. Like causes produce the like effects, and we know that while the speed through the water almost at once begins to increase, when we get a little off the wind in a "bearing-up" ship, the turn through a given number of points is slow in time. Later on, the speed increases as the wind gains more and more power, and the turn through the given number of points becomes more rapid until at last the ship flies into the wind on the other tack. This phenomenon is probably due to the continually diminishing action of the sails against the helm, its complete neutrality, and then its assistance to the helm.

But we are now only concerned with the first part of the arc described, which, I think it will be seen, cannot greatly differ from that of a steamer. Its spirality will be somewhat greater, but I imagine not such as to interfere with my assumption that the stem of  $X$  as a sailing vessel close-hauled on the port tack will, in bearing-up, reach the point  $x^1$ , when, had she kept her course, it would have reached the point  $b$ . This can hardly be an exact statement, but I think it a reasonable generality. It is to be remarked that  $X$ , as a "bearing-up" ship under sail, is not without stopping powers equal to, or perhaps greater than those of a steamer. Simply letting go the lee braces will at once spill the sails, and deprive them of their propelling power, while bracing the head yards a-box will have somewhat the same result as the reversal of a steamer's engines. Close-hauled ships on either tack have, therefore, in the generality of cases, quite as great stopping and reversing powers as steamers, by the use of their braces in throwing sails aback.

If we lastly consider  $X$  in Fig. 1 as a sailing-ship with the wind quarterly, or right astern, we shall at once observe that her early motion under port or starboard helm must be very nearly identical with that of a steamer. The propelling power does not vary greatly, while the retarding and turning powers of the helm remain.  $X$ , as a free-sailing ship under port helm, may be safely assumed to reach  $x^1$  in the time it would have taken her to reach  $b$  under a steady helm. But the free-sailing ship is at a tremendous disadvantage when compared with any other that sails the seas. She has no power of suddenly stopping her way—of reducing her speed—and therefore her power to avoid collision is limited to the use of the helm. She cannot, as a steamer can, turn along the smaller curve  $Xef$ , nor can she by any arrangement make her stem only reach  $x^2$  when with helm amidships it would have reached  $b$ .

Thus we see that on the whole, sailing-ships near the wind are—so far as their powers of avoiding collisions go—in the same case as steamers, when bearing-up; and as steamers with reduced speed or stopped engines when luffing. Free-sailing ships represent steamers deprived of their powers of stopping and reversing.



The whole of the foregoing facts and inferences form some of the chief of those "True Bases" which have given a title to my lecture.

Let us now proceed to the consideration of how the laws we have just discussed affect the avoidance or the bringing about of collision between any two ships. It is evident that the avoidance of collision will greatly depend on a knowledge of true laws and their application to each case, and we shall get a strange and strong confirmation of the laws now enunciated, if we find, on appeal to what takes place at sea, that collisions are commonly accompanied by acts setting these fundamental laws at defiance.

As I am now at work only on the broad bases of a rule of the road, I only propose to deal with the general case of collision. The common case, the average case, and that within whose limits lie the mass of the collisions, and the vast majority of the real disasters, is the case of "crossing ships." This case under the existing law covers indefinite ground, and is governed by three articles in the steering and sailing rules, those, namely, numbered 12, 14, and 18. These articles prescribe that in all cases where two ships are "*crossing so as to involve risk of collision*," one of the two is to "*keep out of the way*" of the other, and the other is to "*keep her course*." The law involved in these articles clearly pre-supposes three things. It assumes—(1) That ships are crossing; (2) That a risk of collision is involved in the crossing; and (3) That there is no impediment to the free action of either ship in obeying the law.

When ships are said to be "*crossing*," it is clear that they are both steering to some single point ahead of each ship. If the speed of each ship, or the relative distance in time to this point, be such that either ship must have passed it long before the other can reach it, then the ships are indeed "*crossing*," but there is no "*risk of collision*." With such cases as this, law has, very properly, nothing to do. Law only interferes for the assurance of mutual safety, and the safety of such ships is in no way menaced.

But when this point—which I have always called the "*collision point*" is at such relative distances ahead of each ship as to make it in the least degree probable that, with their relative speeds, neither ship can pass before the other is up to the point, then we have not only "crossing ships," but "*crossing ships with risk of collision*." In such a case the law is bound to step in, for otherwise both ships would be left without that "understanding"<sup>1</sup> which is necessary between them. Without law, neither ship would "know what the other is likely to do,"<sup>2</sup> and the acts of the one towards mutual safety might possibly thwart those of the other.

Now law might step in in several ways. It once said that two ships under these conditions were each to turn to the right, but it is

<sup>1</sup> Captain Heathcote says: "The principal object in instituting such rules should be, to establish an understanding between the officers of the two vessels." Parliamentary paper, Rule of Road, April 22, 1872, page 8.

<sup>2</sup> "The principal object of all rules . . . is to enable one of two ships to know what the other is likely to do."—Board of Trade, in Parliamentary paper, Rule of Road, August 15, 1871, p. 22.



evident that if there is such a thing as a right and a wrong movement, the law prescribed that half the number of ships which met in this way were to do that which was wrong. But law might, without committing this blunder, prescribe movements to each ship which it might hold to be right. It might say that each should turn *from* the other, or in Mr. Stirling Lacon's well-known words, that "the "one having the other on her starboard side should starboard, and "the one having the other on her port side should port." Under the law of port helm, each ship was ordered to make a movement which relatively to the other was its opposite. But in ordering each ship to turn *from* the other, the movements are relatively alike. So also law might prescribe that each crossing ship was to turn *towards* the other, until they were on parallel courses, and then pass clear. In all these cases the common understanding is got at, and each ship may know what to expect from the other. In the case of port helm, and of the turn *towards* each other also, the ships will, if no collision arises, be presently free to resume their original courses in safety. In the turn *from* each other, however, some further provision must be made, or else the ships can never resume their original courses.

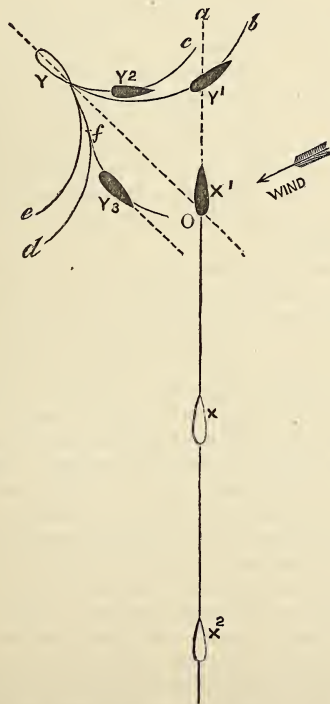
But the law has in fact chosen the third and last plan, in that which it has adopted, and it is not my purpose here to enquire whether that plan be bad or good in comparison with the others, because that might lead to a discussion as to the *design* of the law on the one hand, and the means which have been used to carry it into practice on the other. It is sufficient at the moment to note the words of the law, as I have given them, and to criticise its results, especially in the teaching, ruling, and practice which have grown up under it. Time will not permit me to do much more on this occasion than to take an ordinary everyday meeting of ships which are "crossing with risk of "collision," and to argue the general case from that instance. But I assure you that what I show to be true of the general case, is also true of any particular case, in a greater or less degree.

Suppose then, that X and Y in Fig. 2 are two ships steering towards the common point O, termed, as I propose, the collision point, which is ahead of each. They are, evidently, "crossing ships," but whether they are "crossing so as to involve risk of collision" will depend on their relative distances from the collision point and their relative speeds. In the diagram they are placed equally distant in space from the collision point, and if their respective speeds were also nearly equal, there is the chance that neither can pass the collision point before the other has reached it. Such a condition evidently makes a risk of collision. But suppose X were in the position X<sup>2</sup>, with her stem just twice as far from the collision point as before. Then the ships will still be crossing ships, but there will be no risk of collision if their speeds are equal, for then X<sup>2</sup> will only have got to X when the stem of Y has reached the collision point O. The speed of X<sup>2</sup> must, therefore, be nearly twice that of Y, to make a "risk of "collision." These principles can be readily applied to all cases of crossing ships.

In the case of X and Y, the "crossing angle" Yoa, is four points

of the compass, but it is evident that the conditions of the problem will only differ in degree whatever the crossing angle may be, so long as it is between  $0^\circ$  and  $90^\circ$ , and so long as the distances from the collision point remain equal. It is clear, however, that while "crossing" is a definite thing, "risk of collision" is an indefinite thing. Both are, of course, matters of fact; but while "crossing" is an exact condition depending on the intersection of two straight lines, "risk of collision" is a variable quantity. There cannot be greater or less "crossing," but there always is a greater or a less "risk of collision."

FIG. 2.



The law has, therefore, attempted to establish a common understanding between the two ships by an appeal to a disputable thesis, and there is, unfortunately, good reason to infer that the thesis is often denied by one or both of the parties to a collision.

Such being the case, it is well that when "crossing" is once established, "risk of collision" should be at once assumed by the ship on whom the onus of avoiding collision lies. It is evident, for instance, that the very instant X and Y ascertain that they are crossing, they must know that if things continue as they are, there

may be a collision at O; and, moreover, that if there is a likelihood of collision, every moment's delay increases the danger. X and Y find themselves, in short, in such a position that the "risk of collision," whether it be great or small, *will grow* with every second's delay in acting, until it either results in collision, or passes its maximum danger without one. The function of law in such a case either is, or should be, to reduce any existing risk of collision to a minimum in the shortest possible time.

X and Y, in clear weather, have very abundant and certain means of ascertaining whether or no they are "crossing ships." In the day time they can see that the port bow of one is towards, or opposite to, the starboard bow of the other. At night, the side lights fitted with mathematical accuracy, show when the green light is opposite to the red. No safer or more indisputable ground for a common appeal than these facts offer has as yet been discovered by seamen or others.

But when we come to the further estimate of "risk of collision," we see at once that *time* must elapse before its probable amount can be determined by either ship, and even then no accuracy is possible. Nothing but an alteration in the compass bearing of X from Y, or of Y from X, is capable of showing that there is no risk of collision; and if there be *no alteration*, then collision becomes *certain* if the respective courses are pursued.

It is, therefore, a fundamental question, whether a "risk of collision" is a true base for a rule of the road. Time must elapse before it is discovered, and time in such cases is so precious that it seems strange it should be wasted while appeal is being made to it.<sup>1</sup>

But now let us suppose that X and Y are agreed that they are "crossing so as to involve risk of collision," and let us further suppose that they are both steamers, and that each is fully all alive to the law in such a case. This law declares that Y shall "keep out of the way" of X, and that X shall "keep her course." If the two ships are alone on the high seas, only one thing can relieve X from the duty of keeping her course. This one thing is *proximity so close that it is clearly dangerous for X to keep her course*. But nothing relieves Y of the duty of keeping out of X's way, though after a collision, she may be absolved, if she took proper steps to avoid it on the understanding that X would keep her course. Under close proximity a new condition of things arises. Law has abandoned the case, and a balance of risks and chances must determine the acts of each ship. In Fig. 2, however, the stems of the ships are  $7\frac{1}{4}$  lengths apart, and we must assume that Y should act on the supposition that X will not swerve from her course. How, in such circumstances, should Y interpret the words "keep out of the way"? Some very high authorities think that we cannot give her any advice—at least officially, that we cannot tell her—for instance, that she must, in no case, cross or attempt to cross the bows of X, because "there may" possibly be cases in which a steamer may, in getting out of the way,

<sup>1</sup> No one has put these questions of bearing so well as the present Rear-Admiral de Horsey, in his pamphlet "Rule of the Road at Sea." Ed. Stanford. 1871.

“ find it the best and safest course to cross the bows of the other from “ port to starboard.”<sup>1</sup> Let us examine, by the light of the investigations already made, the truth of this assumed position.

First, of the different things which Y may do, let us suppose she puts her helm hard a-starboard. She will then travel over some curve  $YY^1b$  at a speed reduced from the normal rate by one-third. This will place her at  $Y^1$ , when X, keeping her course, has reached  $X^1$ . The risk of collision has consequently been increased by Y’s improper act, from four ships’ lengths, which it originally stood at, to about one ship’s length; for it is clear that the stem of  $X^1$  will have advanced to that proximity before  $Y^1$  is clear of his path.

But there is a rule which is very wholesome if properly used, and which directs a steamer to reduce her speed when risk of collision arises. Nothing is more likely than that Y, astonished to see the rapid advance of X upon her, should stop, or stop and reverse. If she succeeds in checking her way through the water by one-half, she will find herself in the position  $Y^2$ , when X reaches  $X^1$ . That is to say, she can now hardly escape collision by any act of her own.

Observe, now, that if X has even a quarter more speed than Y, a collision at  $Y^1$  is almost inevitable unless X acts promptly and properly. Observe also that if Y—as she possibly may—requires a larger arc than  $YY^1b$  to turn in, collision becomes still more likely. We must note again that if Y can, by reduced speed, turn along so sharp a curve as  $YY^2c$  she has reached the limit of her powers, and that if X is about to run into her on her starboard side, Y under starboard helm is absolutely powerless to help herself.

But now look at the alternative movement which is involved in the direction to Y not to cross, or attempt to cross, the bows of X. Y under port helm and normal speed will turn along some curve  $Yfd$  at a rate of progress reduced by one-third. If she reduces her speed she will turn along some smaller curve  $Ye$  at a still more reduced rate.

But as Y moves along the curve  $Yd$  or  $Ye$ , and so approaches more and more to parallel courses with X, X herself is continually helping that movement; so that by the time Y has reached the point  $f$ , X will be so much on her port, or safe, bow, that Y may resume her original course in perfect safety and reach the position  $Y^3$  when X is at  $X^1$ .

Now, compare the two classes of movement in reference to the amount of alteration of course required. Y, employing the turn *from* the holding-on ship, and using starboard helm without reducing speed, may just succeed in escaping destruction after altering course at least seven points. By reducing speed and altering course more than four points, she remains in immediate danger of destruction. But by employing the turn *towards* the holding-on ship and using port helm, a turn of three points will leave her free to resume her original course in safety. If she also reduces her speed, a still smaller turn will suffice.

Let us make another comparison, using *time* as our standard. Sup-

<sup>1</sup> See Parl. paper, Rule of Road, Aug. 10, 1877.



pose the ships to be of the moderate length of 240 feet, proceeding at the moderate speed of eight knots, then we have a ship's length in space, equal to 18 seconds in time.  $X$  and  $Y$  under such conditions are originally 72 seconds from collision. In 90 seconds,  $Y$  with star-board helm and normal speed, will place the ships at  $X^1$  and  $Y^1$ , or with reduced speed at  $Y^2$ , and still in danger. But in 45 seconds,  $Y$ , by the use of port helm and the turn *towards* the holding-on ship, will be free to resume her course in safety.

Now, suppose that, considering  $O$  as a centre, and  $OY$  as a radius, we move  $Y$  round so as to lessen the crossing angle  $Yoa$ , it is clear we should carry the positions  $Y^1$ ,  $Y^2$ ,  $Y^3$  round with  $Y$  as though they were rigidly connected to her. The position  $Y^1$  would soon become one of safety for  $Y$ , supposing that the normal speed of  $X$  were no greater than her own.  $Y$  would then have succeeded in passing the point of maximum danger without a collision. But it would be long before the position  $Y^2$  became a safe one, and it would remain excessively dangerous in every case where the normal speed of  $X$  was greater than that of  $Y$ . But on the other hand, as  $Y$  moves more and more towards the end-on position with regard to  $X$ , the position  $Y^3$  becomes continually safer and safer. If in the given positions of  $X$  and  $Y$ , the latter requires to turn three points towards  $X$  before she can resume her original course in safety, it is evident that this turn will be continually diminished the nearer the courses are to placing the ships end-on to one another: while also, as we have seen, all increases in the speed of  $X$  increase the danger of  $Y$ 's turn *from*  $X$ , *the same increases add to the convenience and do not increase the danger of  $Y$ 's turn towards  $X$* . Again, it has to be noticed that as  $Y$  approaches the end-on position with regard to  $X$ , her power of estimating the speed of the latter continually decreases, and as the safety of the turn to cross the bow of  $X$  depends on the right estimate of her speed, the less the original crossing angle is, the greater will be  $Y$ 's uncertainty and risk in attempting to cross the path of  $X$ .

Another point very necessary to note is the small comparative gain by the use of the helm in crossing the bow of another ship.  $Y$  in turning over the curve  $YY^1b$  has used five ships' lengths in time, and is not yet across the bows of  $X$ . Five ships' lengths in time would, under a steady helm, have taken her beyond the collision point  $O$  just before  $X$  reached it.

If we again take  $Y$  and move her round towards  $X$ , carrying the positions  $Y^1$ ,  $Y^2$ ,  $Y^3$  round with her as before, we shall soon reach a condition in which neither turn will be dangerous, as both will take her short of the path of  $X$ . But when we have reached this point, it is still evident that if  $Y$  turns *from*  $X$  she will be wrong, because such a turn will never allow her to resume her original course. It will ultimately take her to the same course as  $X$  is steering, and she must then take some further step to let  $X$  pass her, whereas if she turns *towards*  $X$  she is taking the speediest and most convenient step towards the resumption of her original course in safety.

Still moving  $Y$  round towards  $X$  we see that the above reasoning holds. If  $Y$  is ever going to resume her original course, she must do

it by passing under X's stern; and the sooner she turns to do so, the sooner will the original course be resumed in safety.

Thus we see that when two steamers are crossing at an equal distance in space from the collision point, *it is always either dangerous or inconvenient for the giving-way ship to attempt to cross the bows of the other.* It may be further stated that as about one-half of all risks of collision arise when the crossing angle *Yoa* is between  $45^\circ$  and  $0^\circ$ , it is proportionately more dangerous than inconvenient.

But those who are, perhaps, partly aware of the points now stated, appear to have still in their minds some idea that the case will differ when the distances in space between the ships and the collision point differ. Let us for a moment pause to examine such a case. Suppose X to be twice as far in *space* from the collision point as Y. That will place her at X<sup>2</sup>. Here there are crossing ships, but not risk of collision, unless the speed of X be nearly double that of Y. It still remains safe, and not very inconvenient for Y to make the turn towards X until she brings her on her port bow. The amount of danger due to the contrary movement will depend still, as before, on the relative speed of X. If she has twice the speed of Y, then the case is simply that a collision is certain at Y<sup>1</sup>, for X will then be a ship's length a-head of the position assigned to her at X<sup>1</sup>. If the speed of X and Y were originally equal, Y might save herself the trouble of altering course at all, as there is no original risk of collision.

If, on the other hand, we left X where we originally placed her, and removed Y, say twice as far from the collision point, it is evident that neither turn on Y's part can be said to be dangerous, but that the turn *from* X must always be inconvenient, inasmuch as it places the chance of resuming her original course further off.

Let us now suppose that X and Y are sailing ships close-hauled on opposite tacks, with the wind, as shown by the arrow. Y as being on the port tack, is by law the ship to keep out of the way of the other. Now, we have seen that of the four curves open to the steamer, one of them, namely, YY<sup>1</sup>b, is not open to the close-hauled sailing ship. We see, however, that the curve Ye could be got without much difficulty. Otherwise the case of the close-hauled ships X and Y is just the same as if they were steamers, and it becomes evident that all the arguments in favour of the turn *towards* X, and all those against the turn *from* her apply with double force, as Y cannot maintain her normal speed in luffing. But as Y in luffing into the position Y<sup>2</sup> by way of avoiding X, has deprived herself of all power of locomotion, she has committed a still graver error than the steamer. On the other hand, Y, if she kept away to clear X, would not only run no risk if X did her part of the performance, but would keep herself under control and ready for all eventualities.

The crossing angle of X and Y, as sailing ships, when the wind is as given, cannot be greater than in the figure; but if it be less, Y, as free on the port tack, is still the giving-way ship; and as we have already seen, she approaches more and more nearly to the condition of a steamer deprived of the power of stopping and reversing, as she becomes more and more free, until she is exactly in that condition

when before the wind. But if she is in any position between Y and the end-on position to X, she will obey the same law, and be bound by the same reasoning as we have seen applied to the steamer. That is to say, that whatever we see to uphold or condemn in the general case of X and Y considered as steamers, we must more strongly uphold and condemn in the case of sailing ships where X is close-hauled on the starboard tack, and Y is on the port tack.

Now, in all these cases, which really cover the vast majority of recorded collisions, we find that a movement of Y, tending to cross the bows of X, must be expected to lead to collision, and that a contrary movement, tending to turn short of the original path of X, must be expected to avoid collision. We shall see, on appeal to the recorded facts of collision, that this is not only theoretically but actually true. The movement typified by the curve  $YY^1b$ , does in fact very often precede collision, and the movement typified by  $Yf\bar{d}$  does in fact very seldom accompany collision.

But my nautical hearers will, at this point, be inclined to say that I am using a steam hammer to crack walnuts—that we are all agreed as to the danger of crossing the bows of another ship. My answer is, that *we are not all agreed*. There is no sufficient notion abroad of the danger of this course; and neither the Courts, nor the official authorities, nor the seamen themselves, admit the relative safety and danger of the two turns. We shall appeal to each of these in succession for a confirmation of my statement.

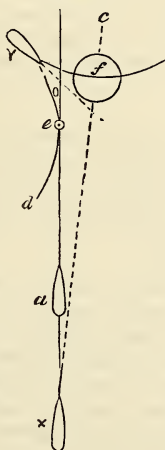
I cannot detain you here to consider other cases, more than just to point out that the same conditions govern them. If, for instance, the wind were in Fig. 2 opposite to where I have placed it, then both ships would be equally free, and equally like steamers deprived of the power of stopping. The difference would be that X would become the ship to give way, and Y would become the ship to keep her course; but what we have learnt as to the proper and improper movements of Y becomes equally cogent as to the proper and improper movements of X. Starboard helm and the turn *towards* the holding-on ship is equally to be recommended to X now, as port helm was to Y when it was *her* duty to give way.

There is but one loophole of escape that I know of from these arguments. Suppose Y, at night, to be so near the collision point O that her turn under port helm must inevitably coincide with or cross the path of X, how can it be recommended that she should turn towards X as a measure of safety? Let us examine this case with the aid of a new diagram, Fig. 3. Here we have Y within half a ship's length of the collision point, so near the path of X, that when the crossing angle is four points, the curve Y describes in turning towards X will coincide with that path. The result of such a turn undoubtedly is to bring the collision point nearer to X, and so far to increase whatever risk of collision there was originally. I must impress on you that the real increase of risk is very much smaller than it appears in this statement, as I shall presently show; but it may stand for the present that there is an increase. The question arises as to what was the original risk? Where, in fact, ought we to



place X in order to make a fair comparison between Figs. 2 and 3? We are, in all these cases, dealing with the law, and we are, therefore, bound to place the ships far enough apart to make it pretty certain that X will keep her course. In Fig. 2 we placed them more than seven lengths apart, and we cannot place them nearer in Fig. 3 with any consistency. This will place X where she is represented to be in the figure. If we were to place her at *a*, the same distance as she was from the collision point in Fig. 2, we should certainly bring in the element of a closer proximity, and a doubt as to whether it was not, in any case, dangerous for X to keep her course. X being where she is, there is no original risk of collision with Y, unless X's speed be more than four times as great as that of Y, a state of things not often to be expected. If Y turns along the curve Y*d*, she will not only

FIG. 3.



advance the collision point in space, but will also retard it in time. It will take her about  $2\frac{1}{2}$  lengths in time, to get end-on to X, and by that time the stem of X will be at *a*, if the original speeds were equal. That is to say, there will be no real risk of collision in any case unless the speed of X be double that of Y. But in the whole of this last investigation we are assuming some very improbable circumstances. In the day-time, it is in the highest degree improbable that Y should assume a risk of collision in such a case as that given in Fig. 3. At night, she would, in my view, be right in assuming it and acting thereon. She would see the red light of X on her starboard bow, and for all she could tell, X might be steering towards *c* and not towards *O*, in which case, as we have seen, Y would be running into the maximum danger if she turned *from* the red light, bringing it more on her bow. But when we allow that there is a danger for Y in turning along the curve Y*d*, supposing X, as we have placed her, steer-



ing towards O, we assume that Y is going to turn on so accurately measured a curve that she will neither cross X's path in the smallest degree, nor turn short of it by more than a distance equal to her own beam. That is to say, that practically, the risk of collision at the point *e* is measured by a space not commonly exceeding fifty feet! But we have already allowed Y a certain power of diminishing the radius of her arc by the stoppage and reversal of her engines as a steamer, or by throwing all aback as a sailing ship close-hauled; and on the other hand, she can always increase the radius of her arc by righting or easing the helm, so that it is very difficult to confine her to this fifty feet, which is necessary to make a collision at the point *e*.

But it may still be urged that Y may either be still nearer the collision point, or may turn on a larger arc than I have allowed in Fig. 3. In this case Y's curve, Y*d*, will cross the path of X; how, then, it may be asked, can I recommend such a movement? The answer is, that the moment Y has crossed the path of X she is free to resume her course, and is no longer bound by any law. In the day-time this crossing is made apparent to her by the masts of X appearing in line, and at night by the appearance of her green light.

These remarks conclude a summary of the facts concerning the general case of crossing ships when the distance between them is great enough to make it safe for X to continue her course under the legal direction; and it is pretty plain that the right movement for the giving-way ship, in all such cases, *without any exception*, is to turn *towards* the holding-on ship.

But if we teach so distinct a doctrine when the distance between the ships is great, and when X will naturally keep her course, it is quite certain that our teaching—whether it be right or wrong—will be used when the distances are so small as to make an “immediate danger,” and to relieve X from all obligation to keep her course. It will also inevitably follow that X, relieved from the obligation to keep her course, will adhere to the general teachings, and will turn towards Y. Should I not shrink from propounding dicta so terrible as that which will lead ships in all cases of *immediate danger* to turn towards each other? I opened my paper by condemning the exploded doctrine that it was safe to turn to the right when in doubt; am I not stultifying myself by my present recommendation?

We shall see, I think, that I am neither stultifying myself, nor giving anything but the soundest advice when I say that even in ordinary cases of doubt, and certainly in all cases of crossing with dangerous proximity, ships should turn towards each other as the safest course. My doctrine, in fact, leads towards teaching that *it is practically safe to direct all ships to give way to all others*, though I do not think it should be pressed to that issue.

A modification of Fig. 3 will give us a very fair basis on which to place the first element of the discussion. In Fig. 3 we saw that Y—especially at night—could have no certainty whether X was steering towards *e* or towards *c*, but when Y reached the point *e*, though she would have increased the risk of collision by bringing the collision

point so much nearer in space to X, and by retarding her own chances of clearing the path of the latter, yet that the risk of collision was limited to a space equal to her own beam. If X was steering to a point only 50 or 60 feet right or left of *e*, there would be no collision even supposing she had a speed which would bring her to the level of *e*, just as Y had reached the same level. The two ships would in short pass each other in safety on parallel courses near the point *e*. But on the other hand, supposing Y made what I now assert to be the wrong movement under starboard helm, that X was steering nearly for the point *c* instead of for *e*, and at such speed as would bring her to *f*, nearly at the same time as Y, then we should have Y making a risk which was measured by her *length* at the point *f*.

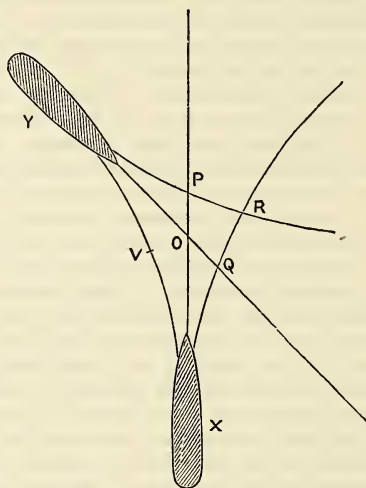
This is a fundamental principle in avoiding collision of which we shall have ample proof when we appeal to the recorded facts, and it may be stated in general terms thus: When the crossing angle is less than a right angle, all turns *towards* the crossing ships tend to decrease the risk of collision until the minimum, measured by the *beam*, is arrived at; but all turns *from* the crossing ship tend to increase the risk of collision until the maximum, measured by the *length*, is reached. As modern ships are commonly six, and sometimes ten times, as long as they are broad, we can say bluntly, that all turns *from* the crossing ship involve from six to ten times the risk due to the opposite movement. These relative risks are consequently well represented by the circles in Fig. 3; at *f*, where the risk is the maximum; and at *e*, where it is at a minimum.

But many persons will be ready to say that I am not taking into account the increased violence of the blow at *e* compared with that at *f*. The desire to mitigate the violence of the end-on, or nearly end-on, blow at *e*, and the assumption that it will be less destructive at *f*, is a very fruitful cause of collision; great numbers of these accidents would be avoided altogether if seamen were less pertinacious in their supposed endeavours "to ease the blow." But the fact is that you cannot have a more destructive collision than that probable at *f*, where either X runs stem on to the broadside of Y, or Y runs stem on to the broadside of X. This in fact appears to be the only kind of blow which actually sinks ships, which may be explained by remembering that the strongest part of one ship is brought into contact with the weakest part of the other. But in the nearly end-on blow, the chances are many hundreds to one that the bluff of one bow will take the bluff of the other, and that no fatal damage will happen to either ship.

These considerations are such as now govern all naval forces when arranging the tactics of avoiding the adversary's ram; it can hardly be argued that they are inapplicable to the tactics of avoiding collision in peace, because in war, all we wish to avoid is allowing the enemy to strike our broadside with his stem: we should be very glad indeed to return the compliment. But in peace, we are quite as anxious to avoid touching our friend's broadside with our own stem, as we are to avoid offering our own broadside to the destructive powers of his stem.

This brings us to the last part of to-day's investigation. We have seen how great is the relative risk of the turn *from* a crossing ship when compared with the turn *towards* her, in all the ordinary cases of crossing, when the angle is between  $90^\circ$  and  $0^\circ$ , and when the holding-on ship may be expected to keep her course. We have now to see how it will be when the distances apart are so small that the holding-on ship is free of the law, and may be expected, under the teaching which I wish to enforce, to turn towards the giving-way ship—each in fact turning towards the other.

FIG. 4.



Refer, therefore, to Fig. 4, where the crossing angle is still  $45^\circ$ , but the ships are so close as to be but half a length from the collision point, and only one length apart. This is a case of the most imminent danger, where it is perfectly certain that under the present law and teaching, neither ship can calculate on any particular movement on the part of the other. If nothing is done by either ship there will be collision at O. If Y turns *from* X, and X does nothing, there will be collision at P. If X turns *from* Y and Y does nothing, there will be collision at Q. If each turns *from* the other, there will be collision at R. All these four collisions will be of the worst kind, or blows approaching the right angle. But if Y turns *towards* X, and X does nothing, there will be no collision. If X turns *towards* Y and Y does nothing, there will be no collision. Finally, if each turns towards the other, there may be collision at V.

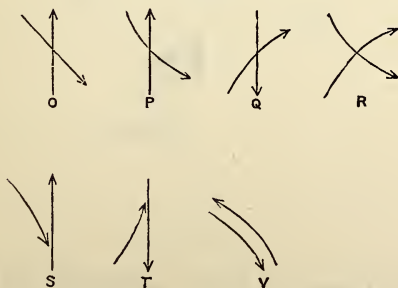
Whatever be the risk of my teaching, it is to be found at this point V; let us, therefore, put the risk to the test. It is first of all evidently at a minimum, as each ship can only present the breadth of her beam as a target to the other, while any alternative movement

offers a target approaching to the full length of either ship. Next it is evident from an inspection of the diagram, that unless X and Y have the same speed, the same turning powers, and are very nearly in the exact positions I have placed them, there will not be a collision at V. For if we move X a single breadth to the right of her position, her arc will fall that much outside the arc of Y. If we place her a single breadth to the left, her arc will fall that much inside the arc of Y. If we advance her by a very short distance, or retire her by a very short distance, her arc will equally fall outside or inside that of Y, and so make a collision all but impossible. So that it is only under very extraordinary conditions that there can be a collision at V, while at O, P, Q, and R, the conditions may be commonly and easily fulfilled.

But there is yet another element of safety connected with the inward turn, which is more than absent in the outward turn. It is extremely unlikely that X and Y should turn towards each other simultaneously: if one moves but a few seconds before the other, she will disclose her movement at night time by changing the colour of her lights, and at once relieve the other from all necessity to turn further. But if the two ships turn *from* each other, neither discloses the other's movement by any change in the colour of the light, and it is only when escape is hopeless that the error is ascertained. Moreover in the inward turn, whichever ship happens to be on the outer arc has full power to avoid a collision by righting the helm. But if X and Y find themselves turning towards R with the outward turn, neither has any power of avoiding disaster, and collision becomes absolutely certain.

Now, looking at all the theoretical bases we have brought forward, and at the inferences to be drawn from them, we can see that for ordinary crossing ships there are seven kinds of collision possible, which I have expressed on Fig. 5, and named O, P, Q, R, S, T, and V collisions.

FIG. 5.



In the O collision, neither ship does anything. In the P collision, one ship does nothing, and the other makes a collision with the outward turn under starboard helm. In the Q collision, one ship does nothing, and the other makes collision with the outward turn under port helm. In the R collision, both ships make collision under the

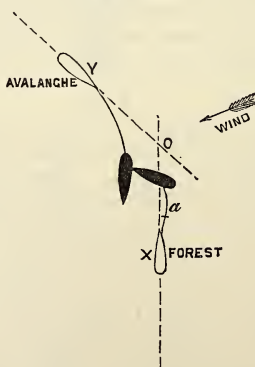


outward turn—the turn *from* each other. In the S collision, one ship does nothing, and the other makes collision with the inward turn under port helm. In the T collision, one ship does nothing, and the other makes collision with the inward turn under starboard helm. In the V collision, both ships make collision under the inward turn.

If my theoretical teaching has any practical value, we ought to find P, Q, and R collisions extremely common, and S, T, and V collisions extremely rare; and if this is so, then we must either say that the inward turns are never used, or that my teaching is founded on the “True Bases for a Rule of the Road at Sea.” I have, it will be observed, omitted those cases where one ship makes the outward, and the other the inward turn; that is, where both starboard, or both port. This is done on the ground that, practically, these come under the P and Q cases. Looking at Fig. 4, it will be seen that the cases where Y makes the inward turn, and X would avoid a collision by making the outward turn, while she would make one by continuing her course, must be very rare; and the ships must be then so close together that there cannot be time to use either helm with effect.

Before, however, we proceed with the appeal to the recorded facts of collision to ascertain whether the theory is borne out in practice, I must do what I have promised, and show that “*neither the Courts, nor the official authorities, nor seamen themselves, admit the relative “safety and danger” of the movements I have contrasted.*” I need not go back to the port helm days which clearly ignored all differences; and the most recent utterances will certainly be the best to appeal to.

FIG. 6.



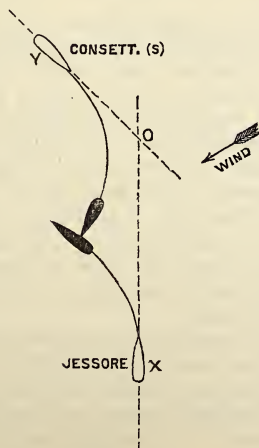
Taking first the Courts, we have a memorable and melancholy instance, complete in all respects, in the judgment of the Wreck Commissioners' Court on the “Forest” and “Avalanche” disaster. The approach of the ships is exactly represented by the positions given to X and Y in Fig. 2, and now transferred. The “Forest,” X, Fig. 6, was under easy sail, close-hauled on the starboard tack. Y, the “Avalanche,” was under more sail, close-hauled on the port tack.

Y, the "Avalanche," was late in moving, but in the end took the inward turn, or, in my view, the proper turn. X, the "Forest," alarmed at the near approach of Y's green light on his port bow, threw himself in the wind at *a*, or, in my view, took the wrong turn. Partly by this movement, and partly by Y's turning, X got to the safe or port bow of Y. But when he got there, the ship was not under command; she fell off, and with her port bow struck the "Avalanche" on her port side aft. Both ships sank, and caused a loss of about 100 lives.

I suppose there can be few people better acquainted with the ruling of the Courts than Mr. Rothery, the Commissioner of Wreck, who, with nautical assessors, tried this case; and when I quote his judgment, I believe I quote the most correct enunciation of the law to be had. He said, "The 'Avalanche' (Y) *had the option either of going 'ahead or astern of the 'Forest,' as she thought fit; but whichever she 'elected to do, it was her duty to do it in sufficient time.'*" This was as to the "Avalanche;" as to the "Forest" he said: "We are not disposed to blame him for ordering the helmsman to luff when he saw 'the 'Avalanche's' green light, *for it was his duty to do so, to see that 'he was close to the wind.'*"

Here we have a clear absence of distinction between the right and the wrong turns for the giving-way ship, and we have something approaching to commendation for what I call the wrong turn on the part of the holding-on ship in the presence of an immediate danger.

FIG. 7.



To complete this latter point, I shall take another recent and very remarkable case, the "Jessore" and the "Consett." The "Jessore" was a large sailing ship, close-hauled on the starboard tack—as X in Fig. 7—and she saw the green light of a steamer—the "Consett"—

on her port bow, as Y in the figure. Knowing that every moment things continued thus, the danger was increasing, and seeing that the "Consett" was not apparently going to do her duty by giving way in time, the "Jessoré" put her helm a-starboard, and brought the green light of the "Consett" opposite to her own green light, and therefore into safety. But just before this time the "Consett" became aware of her own danger, and put her helm to port. Before she had much altered her course, she saw the "Jessoré's" red light disappear, and the green light open on her starboard or safe bow. This was a natural signal to her, *at least to let her wheel go*; for it then became certain that nothing but a continuance of port helm could make a collision. However she not only kept her helm a-port, but those in the "Jessoré" were so ignorant of the turning powers of ships, that when they saw the "Consett's" green light change to red on their starboard side, they actually hailed her to keep her helm a-port—that is, to persist in the wrong movement she was making. The result was that the "Jessoré" was struck about the starboard main rigging, and sank.

The Liverpool Court, which held an official inquiry into this case, condemned the "Jessoré" for starboarding, but did not condemn the "Consett" for persisting in port helm after it had become clearly dangerous.

These two official utterances make a complete case as to the judgment of the Courts on what is right for the giving-way ship, under the law, and also as to what is wrong for the holding-on ship when relieved of the duty of keeping her course by the presence of immediate danger. It is clear that the law is entirely at variance with the theoretical teachings.

Next, as to the official interpretation, we have equally clear utterances. In a series of diagrams and explanations in reference to the rule of the road for steamers, issued under the sanction of the Admiralty, the Board of Trade, and the Trinity House, the case is given of a steamer, Y, Fig. 2, seeing the red light of another steamer, X, anywhere on her starboard bow. The interpretation put upon the direction to her to "keep out of the way of the ship showing the red light" stands as follows:—"She must get out of the way by stopping, or going ahead, or starboarding, or porting, or going astern, as the circumstances of the case may require." Though this only goes to the case of steamers, yet it must be held to apply fully to the case of free ships under sail, and by analogy, as we have seen, to the close-hauled ship on the port tack.

The very large and important Committee which recently sat at the Board of Trade fully endorsed this teaching, asserting that "there may be cases in which one steamer may, in getting out of the way, find it the best and safest course to cross the bows of the other from port to starboard." It must be recollected that this does not in the least refer to cases of "immediate danger," but to the ordinary case of a steamer seeing the red light of another steamer on her starboard bow, and to the proper steps to be taken to "keep out of the way."

Thus far for the Courts and the official interpretation. I shall give

but one illustration to show that we seamen—even we who have made an intelligent study of the matter—have not yet seen it in its true light.

Few more useful hints on this great question have been given than those contained in Captain (now Rear-Admiral) de Horsey's "Practical Directions for complying with the Board of Trade Regulations for Preventing Collisions at Sea." In his hints to ships under sail, close-hauled on the port tack, crossing the path of the ship close-hauled on the starboard tack, our ancient and invariable teaching in the Navy does not mislead the gallant Admiral. His advice is distinct—"Bear away." But when he speaks to the free ship and to the steamer—being the giving-way ship—and crossing the path of a holding-on ship, his advice follows the modern teaching. He tells you indifferently to "alter course several points to starboard or port to assist in altering the bearing" of the approaching ship.

So you see that we are quite out of the fog of vagueness and uncertainty in this matter, and the issue I raise is very distinct. I assert that in all cases of crossing ships under the law there is for the giving-way ship a right or safe movement, and a wrong or unsafe movement. The Courts, the Authorities, and one at least of our leading Seamen, assert that there is no difference in the movements, and that seamen must all be taught that each is equally open to them. It is most important to settle which of the two parties has the truth on their side, as it is perfectly evident that if I am right, then we are all allowing ships to destroy each other for want of a word of warning.

I have made my appeal first to the recorded experiments relating to the manœuvring of ships. The theory cannot be denied, for all the Navies of the world admit it. It can, however, be denied that the theory is of practical value. I therefore proceed to show that this idea is untenable, and I shall do so by appealing directly to the recorded facts of collision.

If theory is of practical application, we shall have, as I before mentioned, a great majority of P, Q, and R collisions, or those which involve the wrong movements; and a small minority of S, T, and V collisions, which do not involve the wrong movements. We must expect to find *some* of these cases, because, after all, at close quarters the risk of a right movement only diminishes from the length of the ship to her breadth, and not to zero; and there will always be cases where collision was inevitable, no matter what movements were made. We must also expect to find cases like that of the "Consett" and "Jessore," so long as mistaken notions are abroad, and it may be argued that no teaching will prevent such cases entirely.

But if all these things are found on an examination of a sufficient number of collision cases to get fair averages—then I consider my case is proved, and that not a moment should be lost in abandoning the teaching thus shown to be false.

I take first the 202 collision cases tried in the Admiralty Courts between 1854 and 1864, published in "The Law of Port Helm," where I find 63 clear crossing cases. Out of these 1 was an O case: 2 were P cases: 24 were Q cases: 24 were R cases: 7 were S cases:



3 were T cases: and 2 were V cases. That is, there were, to make these collisions, no less than 74 wrong movements to 14 right ones. The preponderance of Q cases over P cases—12 times as many—is, of course, due to the then law of port helm. At the present time these cases appear more nearly equal in number. Of the 10 S and T cases, there were only 4 in which each ship saw the other at any distance. In 5 cases, the ship making the right movement did not see the other until close to, while, in one case, the ship moving does not say how far off she saw the other. Of the 2 V cases, one ship making a right movement did not see the other until close to.

So that we have first, a very large majority of wrong movements; and some grounds for supposing that right movements, when made, were made too late. As this table of collisions was drawn up without reference to the present enquiry, there is no note of the damage, nor of the mode of collision, which might possibly place some of the V cases side by side with the “Jessore” case.

Captain Brent has, with the kind permission of Mr. Rothery, drawn up a second table, similar to the one just treated of, which comprises 122 cases in all, which were tried in the Admiralty Court between 1864 and 1869. This table gives the following results:—58 cases where either each ship used the same helm, thus causing the wrong and right movements to neutralise each other: or where the statements of each side are irreconcilable: or where the whole thing is doubtful. 7 overtaking cases, with which we do not deal to-day. 6 cases of parallel courses, where the use of port helm made the collision. There remain 51 ordinary crossing cases where either no movements, or right, or wrong movements were made.

There were of these, 4 O cases, where neither ships did anything: 6 P cases: 21 Q cases: 6 R cases: 5 S cases: 1 T case: and 8 V cases. That is to say, that this second collection shows 39 wrong movements preceding collision to 22 right movements.

Taking the two lists together as a collection of 109 ordinary crossing cases, we get 113 wrong movements to only 36 right ones.

In order to secure myself against a possible mistake in these very remarkable figures, I have appealed to a different sort of record. Whenever ships get into collision near the coast of England, they make independent depositions before the nearest Receiver of Wreck, and these depositions are published in the *Shipping Gazette*. They are exceedingly valuable and instructive, and I have examined and classified all those published between the 1st August, 1877, and the 15th of last January, about 100 in number. As we have usually only one side of the case in these depositions, we cannot deal with them as I have done with the complete cases, but they give generally the same results. There is a large preponderance of wrong movements ingenuously deposed to, of which the following, taken from the *Shipping Gazette* of the 10th of January last, is a fair illustration.

“About fifteen minutes before the collision, I saw the mast-head light of a steamer on my starboard bow about four points. I took his bearing. . . . About six or seven minutes afterwards I saw his red light. I was then running with the wind aft. I kept

"my course, but the steamer appeared to be nearing me on my starboard side, and seemed to be going to cross my bow. He came on within 100 yards of me, and when I saw that he would run into my vessel, I at once put my helm *hard a-starboard*, it being my only chance in the then circumstances to avoid the collision, but it did not quite succeed, for he came on and took me a sliding blow on my starboard bow."

Freely translated, this means, "I saw that the steamer had elected (according to law) to pass ahead of me, I took care to frustrate her movement by myself trying to pass ahead of her."

These depositions, besides confirming the result of the complete cases by abundance of similar depositions to that given above, show also that whenever a right movement precedes collision, it is either frustrated by the wrong movement of the other, or is not taken till too late. The remarkable fact is also disclosed that right movements, when taken at the last moment, do not make bad collisions. Sometimes the damage is confined to spars, at others the bluff of one bow takes the bluff of another. It does not appear that ships are often sunk by right movements.

Upon the whole, wherever we turn, and whatever records we take up, we always find the strongest condemnation given to wrong movements, and the greatest approval given to the theoretically right movements by the facts of the case.

I have no doubt but that you have observed an apparently weak spot in my statement of the results of cases. In the list recently prepared by Captain Brent, there are 8 V cases to only 6 R cases; and this would seem to say that, after all, things are *not quite* as I represent them. But all this idea falls through when we examine the cases. In four of the eight cases the ships were on board of one another before any movement was made, and the remaining four were cases similar to, but worse than the "Jessore" case. The ships on the outer circle in three cases did not turn until after they had had distinct signals by the change of lights in the other *not* to turn. *After* the ships had, by the movement of one of them, got to parallel courses and safety, the other ship went about to make, first a risk, and then a collision by a perfectly gratuitous wrong movement.

How do these wrong movements in such cases arise? To me it is very plain. If seamen are generally taught that being in giving-way ships, it is indifferent whether they port or starboard to either coloured light on either bow, when there are no circumstances to compel one movement more than another; how are we to prevent them from carrying that doctrine into close quarters? I have read you an ordinary deposition on that head—how are we to teach such a deponent that he is wrong to do such a thing when close to, if we teach him that he may do it when far off? And how are we to draw the fine distinction as to the direction in which coloured lights are seen? If it is right for the giving-way ship to *starboard* when a *red* light appears on her *starboard* bow, why should it not be right to *starboard* when the red light is ahead, or even a little on the port bow? It is not easy to make fine distinctions on this head, especially in times of proximate danger. My

teaching, on the other hand, would tend to these very simple dicta—that *the appearance of a green light was always a signal NOT to port*, and that *the appearance of a red light was always a signal NOT to starboard*, and if any faith whatever can be placed in the records of these cases, and any truth in the theoretical data confirming them, such teaching should enormously reduce the numbers of collisions.

I pointed out that there was but one escape from the teaching of the records: that is, to assert that the reason why the so-called right movements so seldom preceded collision was to be found in the fact that such movements were so seldom made. I must conclude by withdrawing this straw from the drowning grasp of false doctrine.

The Q and the S cases both involve port helm only. In the Q cases that helm is in my view wrong; in the S cases it is right. It is quite certain that throughout the whole period over which these cases extend, port helm was used indifferently; but when it was wrong it made 45 cases of collision, and when it was right it only made 12.

MR. STIRLING LACON: Gentlemen, such is the rule of the road at sea! If, instead of this room being filled with its present enlightened audience, it had been occupied by the persons to whom the rule of the road at sea especially applies, namely, our seafaring population—in some respects perhaps the most illiterate of our people—would they have been able to understand, from what we have heard, what the rule of the road really is? Captain Colomb is a representative man, and I suppose, therefore, he represents the views of the Admiralty. (Captain COLOMB: Not at all.) A pamphlet on the rule of the road at sea, just published, has been kindly given to me by Mr. Gray, of the Board of Trade, and this pamphlet also puts the question in a state as difficult to be understood as, I fear, it must appear to you after what you have heard. But, gentlemen, “the rule of the road at sea” is not a question solely for the English Admiralty or for the Board of Trade: it is an international question; and before I show you how simple a matter it is—as simple as two people walking on the pavement, instead of the complicated question which it has become—I must ask you to favour me with your attention while I tell you the view that is taken on this subject in the various maritime countries of Europe and America. I have been twice in Norway, where we held a Conference, which lasted for an hour and a half. I have been twice in Stockholm, and the last time I was there I was exceedingly gratified to find that every little scrap of paper and every pencil-mark relating to the subject which I had left on my previous visit had been stowed away in a pigeon-hole at the Admiralty. After this I went on to St. Petersburg, about four years ago. Here Lord Augustus Loftus kindly came to my rescue, and introduced me formally to the authorities, and two days afterwards sent me to the palace with a card, “Monsieur Lacon, présenté par l’Ambassadeur d’Angleterre.” At the end of thirteen days I had a conference with the authorities on the subject of the rule of the road, which was most satisfactory. I then went to Copenhagen, and the Minister of Marine asked me how long I could remain. I told him I had lost so much time in St. Petersburg that I had very little to spare. He appointed a committee to meet the next day, consisting of a Commodore and seven Captains, and a long conference ensued. Of course I was not in a position to ask them what they thought of this question; but an old Captain whispered in my ear, and said, “You have convinced me.” I have twice had meetings at Hamburg with merchant captains. I then went to Berlin, a perfect stranger, and was granted an audience at the Admiralty. I went before three Admirals and six Captains, and addressed them for an hour and a half. At the Hague the result was the same: and again at Ostend, where we had a conference by order of the Government. In France, the *Revue Maritime et Coloniale*, published under the authority of the French Minister of Marine, states that “Mr. Lacon has left nothing to be desired; his rules are short and concise.” In Vienna I have reason to know that they look upon these rules most favourably.



The United States of America four years ago intimated from Washington, "You have sent quite enough to enable people here to judge of the merits of the case." And the Minister of Marine at Rio has sent me his thanks through the Brazilian Minister in London. Only last Friday I was with the Italian authorities at Spezzia, and they are agreed. What upon? They are agreed upon this: that the old custom and practice of the sea which had existed in every country for centuries, ought never to have been disturbed; and, instead of going to anything new, as proposed by Captain Colomb—

Captain COLOMB: I do not propose anything new.

Mr. LACON: Instead of going to anything new, we ought to return to that which was in existence previously to 1862. Previously to 1862 there was no written law of the sea; and the countries I have now mentioned to you, wish to go back to what had existed previously for centuries.

In considering the question, you must remember that sailing vessels and steam vessels are totally different things. This rule, the custom and practice of the sea (in words) is all that is required for sailing ships, and everything else might be cancelled, viz.:

"A sailing ship on the port tack shall give way to a sailing ship on the star-board tack; a sailing ship with the wind free shall give way to a sailing ship close-hauled. Where two sailing ships each with the wind free meet on opposite courses, the ship which has the wind on her port-side shall pass to leeward."

But, as I have said, sailing vessels and steam vessels are two totally different things. Sailing vessels are actuated by the wind, over which you have no control. Steam vessels are actuated by steam, over which you have every control. The next diagram shows all that is required for steam-ships:—

A steam-ship having another—

"Ahead ..... shall go to the right;

"On her left side .... shall go to the right;

"On her right side .. shall go to the left and stop."

Why do I make use of the expressions right and left? In the earliest days of steam, Norway and Sweden, in consequence of the intricacy of their navigation, were obliged to adopt the practice whereby the direction of the ship's head and the word of command, "starboard" or "port," should correspond; but in England the terms "port" and "starboard" apply to the helm, and starboard in Norway is not starboard in England. In England starboard is port, and port is starboard. Twenty-five years ago the French followed the present practice of England, and a French man-of-war coming out of Christiansand, with a Norwegian pilot, in consequence of a misunderstanding of the steering order, was dashed at full speed upon the rocks. The French, after this, issued an order to their Navy to exercise in this matter care and discretion, and so the thing ran on for fifteen years; and a French Admiral told me he never took a pilot after that time without first asking him, how he understood the expressions "port" and "starboard?" After I had made a stir in the Scandinavian countries about nine years ago, the French issued an order to their Navy, that starboard should mean that the ship's head should go to starboard, and that the term should not apply to the helm; but although they issued that order to their Navy, they did not issue it to their Merchant Service until four years afterwards; therefore, you had in the same country, the Navy, in obedience to the same order, going in one direction, and the merchant ships in another. I discovered this complication about ten years since. A ship called the "Leichardt" was lying at anchor at the Nore; a steamer bound out to Norway, with a crew partly English, partly Norwegian, came down the river, nothing else being near. The pilot and Captain of the steamer were on the bridge; it was about a quarter to six on a November afternoon. They had a steering telegraph lamp showing red, green, and white, and they turned on green. Now green means starboard, and the ship went to starboard, and ran into and sank the ship lying at anchor. The pilot and the Captain intended to starboard the helm, and to go to port; and because the ship's head went to the right when they intended it to go to the left, the pilot jumped to the conclusion that the Captain had altered the telegraph lamp, so he knocked the Captain down, and the Captain rushed down into the cabin and entered in the log that the pilot



was drunk. An enquiry was held at Greenwich, and the man at the helm (at the stern) swore through thick and thin that he starboarded; but nobody had the sense to ask him, What did he starboard? Did he starboard the ship's head or did he starboard the ship's helm? But besides this question of the verbal order there is also the question of pointing or motion. Last June, on my way to Sheerness, I watched the Captain of the ship, and noticed that when he pointed, the ship's head went in the *same* direction. A week afterwards I returned from Ramsgate, and noticed when the Captain pointed, that the ship's head went in a *contrary* direction. I expressed my great surprise at this, and was told that the custom at sea and in the river was different. Now I wish to apply what I have told you to the collision between the "Alberta" and the "Mistletoe." You will recollect that the "Mistletoe" was going over from Portsmouth to Ryde. The "Alberta" came down from Cowes. The quartermaster of the "Alberta" gave this evidence. "The order was given 'by word of mouth, the usual custom is by motion.' Starboard by word of mouth is to go to the left, and starboard by motion is to go to the right. The Officer in charge stood upon the bridge of the "Alberta," and probably said over his shoulder, "starboard," in order to pass under the stern of the "Mistletoe," but instead of going under the stern of the "Mistletoe" the head of the "Alberta" began to go to starboard. As a proof of this we have the evidence of the "Mistletoe" luffing to get out of the way, but the poor Captain of the "Mistletoe" was drowned, and was not able to tell us his story. The head of the "Alberta" going off to the right, the Officer in charge would say "Starboard, Sir, d——n it, did I not tell you to starboard the helm." "No, sir, you did not, you told this man to 'starboard.'" And the result was, although the vessel was stopped, the wheel having been reversed, the rudder was powerless, and she drifted helplessly down upon the "Mistletoe," and sank her. That, I believe, is the true story of the "Alberta" and the "Mistletoe." Again you have the case of the "Murillo" and the "Northfleet." Is it not an astounding thing that a vessel lying at anchor should be run into by a steam-ship? There must be some unexplained cause for this. Then there is the case of the "Franconia," and the "Strathclyde." In broad daylight, about 4:15 p.m., the "Franconia," an overtaking ship, suddenly ran into and sank the "Strathclyde," both ships steering almost the same course. On board the "Franconia" there were two pilots, an English pilot and a French pilot. From Grimsby to the South Sand Head Light, the English pilot had charge of the ship, and his order "port" implies, according to the custom and practice of England, that the ship's head shall go to the right. From Dungeness to Havre, the French pilot has charge, and his order "port" implies, according to the decree of the French Government, that the ship's head shall go to the left. During the interregnum, namely between the South Sand Head and Dungeness, the Captain had charge, when the accident happened. There was no steering telegraph on board the "Franconia," and the man at the helm was at the stern, 150 feet from the bridge. There was no evidence how the order was given, whether by word of mouth or by motion. At the Central Criminal Court this state of things was brought to the notice of counsel for the "Franconia," both before and during the trial, but no question was asked in order to elucidate the subject, and a verdict of manslaughter was the result. Now let us test the simplicity of this rule which I have drawn up. "If a ship has another ahead, she shall go to the right. If she has another on her left side, she shall go to the right; if she has another on her right side, she shall go to the left and stop." Why? Because if I go to the right, I am entitled to go on, and if another vessel is showing her red light to me, we pass in safety. If she is showing a green light, she is bound to stop and let me pass. In the same way, if I show her a green light and she shows me a red light, she is entitled to pass and I am bound to stop. If she shows a green light to my green light, we pass in safety. Adopt that rule and you may do away with every other rule in existence. By these rules you will get rid of 800 unnecessary words both for sailing ships and steam-ships. There is no other rule necessary except these:—

- "A steam-ship, except when towing, shall keep out of the way of a sailing ship.
- "Every vessel overtaking another, shall keep out of her way.
- "A steam-ship, in a fog, shall go at moderate speed.
- "Vessels having been in collision shall assist each other."

That is all that is required. Let me illustrate the application of the rule by what has happened. Her Majesty's ship "Amazon" and the "Osprey" saw each other five miles off, and as the "Amazon's" sails were lifting, young Loveridge, the Sub-Lieutenant and Officer of the watch, starboarded his helm, and shortly afterwards the "Osprey's" light was reported two points on the "Amazon's" starboard bow. The decision of the court-martial, consisting of an Admiral and eight Captains, which sat in this case was, "The collision was caused by a grave error in judgment on the part of Sub-Lieutenant Loveridge, the Officer of the watch, in putting the helm of the "Amazon" to starboard instead of to port, when first sighting the light of the "Osprey" (the vessels being then five miles apart), in contravention of the regulations "for preventing collisions at sea." Sub-Lieutenant Loveridge was cashiered, but recommended to mercy, and the sentence was ordered to be read on board all Her Majesty's ships in commission. Would the sea be navigable if a vessel was not allowed to starboard or port, when another vessel was five miles off? But this young Officer was dismissed the Service for doing that. He having starboarded his helm, and gone to port or to the left, what happened? The "Osprey," seeing the light of the "Amazon," ported, and the vessels came quickly into the position (illustrated by models), the usual position in collisions. What does my rule say? "A vessel having another on her right side, at night showing a green light, shall stop and let the other pass." Is that not better than to do what was done? Having first of all starboarded, the "Amazon" now suddenly ported her helm, and struck the "Osprey" on the counter, and both ships were sunk; the country losing a fine new ship fully equipped, and having to pay £36,000 damages for the "Osprey," besides the loss of eleven lives! Then again there was the case of the "Surat," carrying the mails, and Her Majesty's ship "Euphrates," in the Red Sea. The "Euphrates" showing a green light went across the bows of the "Surat" at full speed. I say "a vessel having another on her right side, at night showing a green light, shall stop, and let the other vessel pass," but the Captain of the "Surat" was an experienced, careful man, and rather than risk a collision, he *stopped*. When he came to England, he made a report to the Peninsular and Oriental Company's Directors of what the Captain of the "Euphrates" had done, and the Captain of Her Majesty's ship "Euphrates" made an apology; but I want something more than an apology, I want to make it law that a vessel having another on her right side, or showing a green light, shall stop and let the other pass. If I am in a ship showing a red light, I am entitled to go on, and the vessel showing a green light is bound to stop and let me pass. In the same way if I show a green light I am bound to stop and let another vessel showing a red light pass. It is as simple as two people walking on the pavement, and yet it has been made a most complicated affair in our blue books and otherwise. What I have pointed out to you is all that is necessary for "the rule of the road at sea."

MR. SCOTT RUSSELL, F.R.S.: As a landsman I would rather not intrude any opinions of my own in a meeting where so many sailors are present, the only opinion I could offer being that of a landsman. I will only venture to say, that the very interesting paper we have heard has convinced me, and, I think, has convinced all of you, that the question, what two Captains are to do when they see their ships very near each other, is an awfully difficult and complicated one; and it appears to me, that if, when we came in sight of the other ship, we had got to pass all those diagrams through our heads, and then to ask ourselves, which of all these cases is going to happen, and if we were to say, "Am I to do as O does, or as P does, or as Q does, or as R, or as S, or as T, or as V?" I think we should do our work a good deal too late. It is plain to me, from the admirably lucid exposition that we have had, that all these things will be done in practice a great deal too late. If rules and legislation are to do anything, I think they must do these two things: first, wipe out all those beautiful diagrams, and principles, and expositions; and, secondly, wipe out all the complicated, beautifully-worded rules of this blue book, for the instruction of men steering ships, out of which I will read you one little passage. The rule, that when a ship meets another she is to keep to the right, contains the plain words of common sense and custom; and now I will give you the words of this charming blue book which I hold in my hand.

The CHAIRMAN: Let me explain to the meeting, that the thick blue book which

Mr. Scott Russell has in his hand does not refer to the rule of the road at sea alone, but it contains the whole law of merchant shipping.

MR. SCOTT RUSSELL: All that sailors ought to know; and I hope that nobody will be asked to carry this book about in their heads before they are supposed to be entitled to steer a ship.

Now, I will tell you what this blue book says. The plain common sense words, as I have said, are, "when two ships meet each other each shall keep to the right," but this book says, "whenever any ship, whether a steam or sailing ship, proceeding in one direction, meets another ship, whether a steam or sailing ship, proceeding in another, direction, so that if both ships were to continue their respective courses, they would pass so near as to involve any risk of a collision, the helms of both ships shall be put to port, so as to pass on the port side of each, and this rule shall be obeyed by all steam-ships and by all sailing ships, whether on the port or starboard tack, and whether close hauled or not, unless the circumstances of the case are such as to render a departure from the rule necessary, in order to avoid immediate danger, and subject, also, to the proviso that due care should be had to the dangers of navigation, and as regards sailing ships on the starboard tack close hauled to keep such ships under command." Is that plain common sense? Is not the old rule of the road at sea by custom something infinitely better and more lucid than this long rule? And now let me sum up in three words all I have to say on the subject. Every man knows who is taught, as I was as a boy, to navigate a ship, that in steering a ship we are steering according to our instinct, our common sense, and our custom; but this book, the whole legislation of the Board of Trade, appears to me folly, because it asks a man who is steering a ship, and whose duty is prompt action, to make an infinite number of calculations of probabilities and improbabilities before he performs the simple operation of keeping the ship out of the way of the other ship. For that reason, I beg to say, that I wish to see the whole of the Board of Trade legislation on that subject blotted out. I should like to see short rules even more laconic than Mr. Stirling Lacon's rules put into practice, and I would add to all these rules another, which is a rule of common sense, that "when obeying these rules, or any others, would cause danger or risk collision, then *break all rules*."

MR. LIGGINS: I learned the rules of the road at sea when a boy in the English Channel, and have taken an interest in them and in their successful working, and have used them in all cases, as far as opportunity has offered, from that time to this, and I came here to-day, with very great anxiety, to learn something new, which might have a tendency to improve the safety of those who "go down to the sea in ships." But I must say, coupled with the explanation in connection with these diagrams, I feel sadly disappointed, for I am perfectly satisfied that Fig. 2 clearly indicates the advantage of the present rule of the road at sea, that when two steamships meet they should each port their helms. If you, for a moment, look at the letter "Y," and suppose she is, at this moment, in the position she is there represented, the letter "X" being the other steam-ship, clearly, if the ship "Y" ports her helm, she makes a curve towards the letter "D"; if, at the same time, the ship X ports her helm, she will make a curve in the opposite direction; it is quite obvious to everybody that those two ships could not possibly come into collision. It is all very well for the gallant Officer to talk about so many ship's lengths apart. We must remember that ships in clear light, when they can tell the number of lengths they are apart, do not come into collision. As a rule, collisions happen on dark nights when the lights are imperfectly seen, or they happen in the day when the fog is thick, so that the ships are not seen at all until they come so close that it becomes a question with both Captains what they will do. Is it not better, under such circumstances as these, that the Captain in each ship should at once know the right thing would be to port his helm? Both ships might possibly do wrong if their position was different to that drawing, but if both ships port their helm under such circumstances as that diagram illustrates, I contend that the safety of each ship, in ninety-nine cases out of a hundred, is thoroughly secured. It is where you leave it optional that difficulties have arisen; and I notice that the rule of the road, as laid down in the law, is pretty clearly enforced, and it is only in exceptional cases that our Courts allow departure from it under any circumstances. Take the case of X and Y,



two sailing ships; clearly, if X, being on the starboard tack, keeps her course, and Y, being on the port tack, ports her helm, she puts herself into the position of the curve of the letter D, and no collision can take place; but if there is to be a hesitation as to whether Y should starboard her helm and go up the curve B or A, then, I think, the collision will be almost certain; in nearly every case it would be so, but if Y ports her helm and keeps away, X, according to rule, will hold her own, and no collision can occur. I have very often in crossing the English Channel, as I have done four times lately in gales of wind, found that captains of the steam-boats on that service, and pilots navigating ships in the Channel, are very averse to any alteration of the rules; and I have noticed that it is not experienced men of that sort who agitate for any change. I am not of opinion, with Mr. Scott Russell, that it would be well to wipe out all that is contained in that book. Who are the authors of these rules and regulations? Not the gentlemen of the Board of Trade alone, but the Elder Brethren of the Trinity House, the Lords of the Admiralty, and their nautical advisers of every grade were consulted; and they have done more than that, they have adopted rules that have been recognised for generations of clever men before us, from the days of Lord Nelson. It is a recent thing, within the last forty years, that there has been so much legislation upon the subject, but the legislation, in my judgment, is simply to enforce the rules that the experience of ages has found to be necessary, and, therefore, we should be very chary indeed of altering them, and the more so for this reason, that foreign countries, the United States, the French Government, the Italians, the Spaniards, the Portuguese, Norwegians and Danes, old seamen and sailors, and other maritime nations, have done us the honour to adopt our rules. I know there is some little difference of opinion as to the rule of starboard helm and port helm, whether the helm of the ship being put to starboard the vessel shall go to port, or whether the ship shall go to starboard in the French service, but, I believe, the rule has been decided, and that they now adopt, in every respect, our mode of expressing our rule. We must be very careful in altering the rule of the road at sea, because, by doing so, we may run the risk of collision with other countries, and it is essential that all nations should have one universal code of regulations, and I thought that was the case at the present time.

MR. SCOTT RUSSELL: No.

MR. LIGGINS: I certainly was under that impression, but it is a point that ought not to be settled in this room without very serious consideration by those who are largely interested in the safety of ships at sea, and I should be very sorry indeed to see the port-helm a thing of by-gone days.

Captain COLOMB: It is gone; there is hardly such a thing known.

MR. LIGGINS: I was sailing a match not many years ago in the largest cutter in the world; we met another very large cutter of 185 tons crossing on the port tack, and the vessel on the starboard tack, to avoid collision, gave way and luffed, simply because the vessel on the port tack refused to obey the clearly laid down rule of the road by giving way. Both these vessels would have been sunk some seven or eight miles from the land, and fifty or sixty people would have been drowned, if it had not been that the Captain on the starboard tack, to prevent serious collision, used his judgment; and I believe if an accident had thus occurred, the Courts would have exculpated him for breaking the rule, because it was quite clear the other intended to hold his course against the rule of the road. If he had ported his helm, and got out of the way at the proper time, there would have been no necessity to force the other Captain to break the rule.

MR. ROTHERY: I should have had some reluctance in rising to take part in this discussion had not the gallant Chairman called upon me; but as he has done so, it would be uncourteous in me not to say a few words on the subject of the paper which we just heard read. My objections were twofold. I felt that not being a member of your honourable Institution I had really no right to speak at all. But my greatest objection is that which has been so forcibly urged by Mr. Scott Russell, that as a landsman I could really know very little about the matter compared with the many gentlemen whom I see about me. At the same time you may perhaps be, I will not say anxious, but willing to hear what a landsman's views upon the subject are, for as it often happens that those accustomed to travel along a beaten track miss



objects which strike the attention of those to whom the path is new, for a landsman may present the matter in a new light to seamen, who from their greater knowledge would be much more able to draw useful deductions therefrom than he can be. Now whether we do or do not agree with Captain Colomb in the paper he has read to us, I think we must all be very grateful to him for the care and attention which he has paid to the subject—a subject the most important perhaps that can occupy the deliberations of a distinguished society like this. We shall all too, I think, agree that he has treated it with marked ability from this our point of view. And the few observations which I propose to make, and they shall be very few, shall be directed rather to elicit from Captain Colomb explanations upon points which, either owing to my own obtuseness or my want of nautical knowledge and experience, are not quite clear to me. If I rightly understood Captain Colomb, what he told us was this—that ships should generally turn their heads not from one another, but to one another; for instance then, when a vessel sees a red light on her starboard bow as on the plan of the “Avalanche” and “Forest,” or a green light on the port bow, the vessel, as I understood, ought to turn her head towards the other.

Captain COLOMB: As she has done.

Mr. ROTHERY: Exactly. Then the difficulty that I have is this. At night, for that is the time when most collisions occur, how is a vessel which sees the light of another vessel to know the exact direction in which the other vessel is proceeding? She sees a red light upon her starboard bow, the course of this vessel may be more or less inclined to her own course; and there are positions in which if she ports, the two vessels must come together. It appears to me to be a difficulty, but I have no doubt that Captain Colomb will be able to explain it. Take some of the plans prepared by Captain Colomb. Suppose in Fig. 4 that “Y” ports her helm at once, she must inevitably run into “X.” Or take Fig. 2, if “Y” ports when she sees the light of “X,” it is much more likely to produce a collision, assuming that their velocities are equal, than if she either held on her course or starboarded. That is one difficulty which occurs to me. I fully appreciate Captain Colomb’s remark, that by exposing the whole length of a ship’s side to the approaching vessel you cover a greater space of water within which a collision can occur than if they were on opposite courses, the length of a ship being so much greater than the breadth. But that does not remove the difficulty which I feel as to vessels when they sight one another, turning their heads towards each other. However, I thought that I would mention my difficulty in order to give Captain Colomb the opportunity of explaining it away.

Captain COLOMB: I think practically the answer to Mr. Rothery will be found when I have the pleasure of sending him the paper in complete form with the diagrams. If he will then closely consider the letter-press beside the diagrams, he will see that the questions he has put are there as clearly answered as it is possible to answer them. The case referred to in Fig. 4—

Mr. ROTHERY: I meant Fig. 7, one ports and the other starboards.

Captain COLOMB: “Y,” you observe, has ported, and has continued to port, after she had a distinct signal *not* to do it. “Y” was travelling down her curve, “X” was travelling along her curve, and at some point they both came to parallel courses. In that condition of things “Y” saw, on her starboard bow, the green light of “X;” it was then her business to have simply let go her helm, and she would have gone off at a tangent to her arc. What was wrong in her was, to persist in porting after she had seen that the ships were on parallel courses, and that the risk had passed.

Mr. ROTHERY: I have not made my meaning quite clear. The “Jessore” turns her head towards the “Consett,” was that right or wrong?

Captain COLOMB: I say—right.

Mr. ROTHERY: I think she is wrong.

Captain COLOMB: She must have acted on the following supposition:—The “Jessore” is bound under the law to continue her course without variation, till the proximity becomes so close that it is clearly dangerous for her to do so. Then the question arises—when she is relieved from the obligation to continue her course, what is she to do? I say she ought to have brought the “Consett’s” green light on her safe bow. Why? Because she makes her turn on an understanding that the other

ship is not going to give way as she ought to do. If she makes that turn and the "Consett" has no look out, she is clear; but if she makes the other turn, under port helm, and the "Consett" has no look out, she gets into the position of the Q collision in the Figure 4; but if she gets close, starboards her helm, and passes towards Y, and Y has no look out, X saves herself: whereas if X puts her helm to port and crosses the path of Y, she destroys herself. They are free of the law by reason of their proximity, and then it becomes a matter of risks and chances. Diagram 3 shows that the risk in turning towards Y—the starboard helm—for X is measured by that little circle shown at E, whereas the risk of porting her helm is shown by the big circle F. Therefore I say when it comes to matters of risk, choose that which gives the least risk.

Mr. ROTHERY: You do not mean that the "Jessoré" would be right in starboarding as soon as she sees the other.

Captain COLOMB: No. The question is, when she gets so close that the law ceases to have hold of her, what is she to do? Then she ought to "give way."

Mr. ROTHERY: You mean when a collision is inevitable.

Captain COLOMB: No; very often she may avoid it, at the last moment, within a length.

Mr. ROTHERY: I think Captain Colomb's observations are extremely valuable. I quite see the great value of what he says, that it is merely the breadth of the ship that has a chance of being struck; whereas when the vessel goes off, it is the whole length of the ship; but at the same time I do not see the value of a general rule such as he has laid down.

Captain COLOMB: I do not lay down a rule. I am not raising a single question as to the law; I am not touching the law. I am very sorry the discussion turned in that way; because I am asking what should we seamen do, and what should the Courts teach us to do, *under the law*.

The CHAIRMAN: Unfortunately I have duties in another place. I should not, however, like to leave this theatre without saying a few words with reference to the very interesting lecture that we have heard. I am sure I am expressing the general sense of those who are present when I say that Captain Colomb, who has given us a very able and interesting paper, that Sir John Hay, Mr. Stirling Lacon, and all other persons who occupy themselves in carefully watching the cases of collision which occur for the purpose, if possible, of improving that law, are doing a public service and deserve the thanks of the maritime professions. Speaking as a member of the Legislature, I would say our course upon these matters is perfectly plain. It is our duty to take the best advice which can be obtained and frame our legislation in accordance with that advice. The House of Commons is advised by the Board of Trade, and the Board of Trade is advised upon these matters by the Admiralty and the Trinity House. I think the Legislature is adopting a wise course in confining its action to what is advised by the Admiralty and the Board of Trade.

Mr. SCOTT RUSSELL: Excluding foreign advice?

The CHAIRMAN: Certainly not.

Mr. SCOTT RUSSELL: That is the critical point.

The CHAIRMAN: Of course not. The rules cannot be international unless other nations are agreed to them. The rules are of very little use unless all maritime nations will consent to abide by them, and, as far as my information goes, the rules are international.

Mr. SCOTT RUSSELL: No.

The CHAIRMAN: Will you tell me the exceptions?

Mr. SCOTT RUSSELL: Mr. Stirling Lacon can, no doubt, give you the exceptions.

Mr. STIRLING LACON: England and France made these rules, and they were agreed to by thirty-four other countries in blind faith, without consideration; but many of these thirty-four Powers, and America especially, wish to repudiate them.

Mr. ROTHERY: At any rate they have consented to them.

Mr. STIRLING LACON: They have consented; but the Americans now say, "they know what is best for themselves, and in future intend to act independently."

The CHAIRMAN: I should be glad if Mr. Lacon would mention to us what eminent maritime nations do not abide by these rules.

Mr. STIRLING LACON: I have told you that America has repudiated them,

and Sweden and Norway, and Denmark and France, in the strongest language addressed to this country, have asked for a change.

The CHAIRMAN: Have they actually repealed these rules?

Mr. STIRLING LACON: I do not know.<sup>1</sup>

The CHAIRMAN: We are all agreed that the rules are of very little practical value unless they are international, and they cannot be international unless other nations agree to accept them. It may be, differences of opinion may arise from time to time as to the expediency of these rules. The duty of any nation, which, speaking by the lips of its maritime authorities, disagrees with any one of these rules, is to make an appeal to the international tribunal. Passing from this point, I would venture to say, the rules are of very little value unless those whose duty it is to go to sea interpret them intelligibly. The majority of the collisions which occur, happen not so much from any imperfection in the rules as from some imperfection in the interpretation of them, or some carelessness and want of seamanship on the part of those in charge of ships. In Captain Colomb's very interesting paper, he quotes two recent cases of collision which have been before the Courts. I was interested to observe in his account of those two collisions, that the word "time,"—sufficiency of time,—is a prominent feature in both of them. In both instances a collision occurs, because one or other of the ships, whose duty it was to do a particular thing, did not do it in sufficient time, and the fact is, that time and distance are the vital elements in these matters. A thing may be right to be done when ships are a certain distance apart, but very wrong when they are at a different distance. I think that remark extends to Captain Colomb's suggestion. The movements which he prescribes may or may not be the right movements. That must depend upon the interval which separates the two ships from one another. It, also, must depend very materially upon the point insisted upon by Mr. Rothery, namely, the course steered by the ship whose duty it is to keep on her course, and which the other ship ought to avoid. No absolute rule can be laid down. The ship whose duty it is to avoid another must have regard to the course which that other vessel is steering, to the speed at which she is travelling, and to the distance which separates the two ships from one another. That being so, I think it really is better to leave the matter where it is now, according to the much abused rules. The rule is, "when two ships are crossing, the ship which has the other on her starboard side is to keep out of the way of the other." Mr. Scott Russell has insisted upon simplicity of language, I do not know how you could put a thing more simply than that. He can do it by porting, by starboarding, by putting on increased speed, heaving to, or by tacking. I remember once we had this matter discussed before the Royal Commission, and a Trinity pilot said, "When I am in charge of a sailing ship, and in doubt, I always go about." That might almost be construed into a golden rule for seamen, "when in doubt go about." It would be most presumptuous in me to offer to a professional meeting the result of the experience of an amateur, but professional seamen will appreciate one vital rule which I lay down for myself as an amateur. I ought not to be so confident in my power of estimating distances as professional men are, and, therefore, I take extra care, I give way when perhaps it is not necessary to give way, stop when it may not be necessary to stop; in short, I take every pains that I do not, in my little ship, put myself in that state of proximity with another, in which professional skill in the application of these rules becomes of vital importance. I do not know that that would not be a rule which ought to be more frequently adopted by professional men. It is by shaving things too close and from the unwillingness to resort to stopping, that so many accidents occur. While attaching great importance to the practice of stopping, I will hesitate to go so far as Mr. Stirling Lacon does, and to say to a man, in all cases, he shall stop. I must not detain you any longer. This paper is a very valuable contribution to the literature of this subject. I trust that when it is published it will be accompanied by the diagrams which we see on the walls, for without those it

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<sup>1</sup> No country by itself can repeal an International Law; but England, by an Order in Council, which has no effect as regards foreign countries, has altered the law contrary to the strongly expressed advice of the Privy Council.—W. S. L.



will lose a great part of its interest and value. Assisted by those diagrams, I have no doubt the paper will set men thinking upon these things, and tend to keep those who are responsible for giving advice to the Government alive to the fact that their proceedings are constantly under observation. I am sure I shall only be expressing what is felt by everybody, when I say we are very grateful to Captain Colomb for his paper, and that we recognise in it that ability that has never been wanted in the speeches he has made and the papers he has read before this Institution.

Mr. STIRLING LACON: Mr. Chairman, you asked me a question, and I did not at the time recollect that several countries besides those specified, have expressed a desire to have a revision of these rules.

The CHAIRMAN: It is one thing to desire a revision and another thing actually to carry that desire into effect.



## LECTURE.

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Wednesday, February 13th, 1878.

LIEUT.-GEN. C. P. BEAUCHAMP. WALKER, C.B., Director-General  
of Military Education, in the Chair.

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### MILITARY NOTES ROUND PLEVNA AND ON THE DANUBE, DURING DECEMBER, 1877, AND JANUARY, 1878.

By Lieutenant FRANCIS WELCH, 25th Regt., King's Own Borderers.

I SHOULD not have had the temerity to appear before you were it not for the kindly advice and encouragement I have received from one whose voice has been heard in this room. Though a soldier of no mean capacity, he wears a black coat; his experiences of modern warfare are many—I speak of our latest maker of military history, Mr. Archibald Forbes.

*Red Cross Hospitals at Bucharest and Turnu Magurelle.*—Towards the end of last November, Mr. Henry Shaw Kennedy, 41st Regiment, and I found ourselves at Bucharest. We examined the hospitals there. We found big men, big chest measurements, but rather more groaning than would have been found in an English hospital. The number of hand-wounds pointed to firing over a parapet, the hands only thus being left exposed. The men hit in the head would, of course, have been killed.

At Turnu Magurelle were the wounded from the Rachova action, with the same enormous percentage of hand-wounds. The doctors here openly stated that from the position of the wounds they considered many of them self-inflicted. The Roumanian account of the fighting at Rachova said that there was a regular *mêlée*—that bayonets were used. We hunted for a bayonet wound, and becoming acquainted with Dr. Maturin, found he had seen one out of 500 cases that had passed through his hands. The wounded man had no story to tell, and did not know how he had been wounded. Considerable jealousy seemed to be shown by both the Russian and Roumanian authorities to our Red Cross medical men. They were kept back, often perforce kept idle, when there was work enough to be done at the front. The Roumanian doctors, with the exception of General Davila, who, by the way, is a Frenchman, do not seem to have impressed our doctors with

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their skill. One was pointed out to me who had earned the title of "Old Mortality," through the number of cases that had terminated fatally under his hands. One thoughtful arrangement was in vogue, the invention of the only foreign medical man in the Russian service, an American. This was a "brassard," placed on the arm of each wounded man on the battle-field, so that every one could see that those so marked would be taken care of, and could at once pass on to the succour of the less fortunate soldiers who were not thus labelled. The great complaint among the doctors at Turnu Magurelle was the long delay that occurred between the time the men were wounded and when they arrived in hospital. Some of those wounded at Rachova were jolted about in common wooden carts for nearly three days, entirely exposed to the wet and cold; a good many of them were starved as well. They also complained of a dressing used at the front; some preparation of iron, which stopped bleeding very quickly, but the after effects of which were very detrimental to recovery. There is something to be said on both sides about this. The doctors on the field have no time to attend each case as it should be attended to. This application gives each some chance of life, and at all events stops bleeding to death on the spot. After the Gravitza attack, men were three days before their turn came to be attended to.

*The Bridge over the Danube at Nicopolis.*—To begin with the river, it was about half a mile wide. On the north side, it is approached by a road running on an embankment through low-lying ground, for a distance of 2 kilometres. On a bank from which this road comes, is Turnu Magurelle. This low-lying ground is flooded in spring, and was in a transition marshy state when Nicopolis was taken by Krudener. Half-way from Turnu the road was under repair, the carts here consequently left it, and wandered about the road, each one trying a fresh place, in the hopes of finding it lighter going, finally all converging again at the bridge head. On the southern side of the river, rising straight from the water, is the strong fortress of Nicopolis, the town nestling at its foot. The current of the river is about the same as that of the Medway when the tide is ebbing its strongest, and is principally felt towards the southern bank. Across this half mile of water was a bridge of 100 punt-shaped pontoon boats (see Plate IX, Fig. 1). The distance between boats from centre to centre, was 8 yards. The boats were anchored with very short lengths of cable to all sorts and sizes of anchors. The up-stream cable was rope, the down-stream one chain. Why the stronger fastening should be where was the least resistance, was probably that the chains were not sufficiently long for up-stream cables. In each boat which was not decked stood a six-legged trestle, very solidly bound together. These trestles were not fastened to the boats, but stood on a frame that exactly fitted into the boats. On the top beam or transom of the trestle, and at right angles to it, were placed at equal distances four square road-bearers. These road-bearers overlapped very considerably; they were clasped to the transoms and to each other by iron bands, so tightly screwed up that the iron bit into the wood. On the road-bearers were placed the



Fig. 1

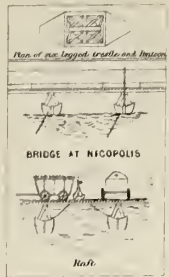


Fig 2

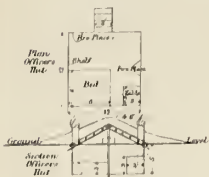


Fig. 3

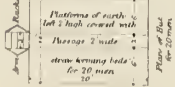
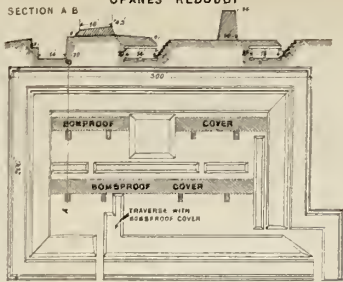


Fig 3

## OPANES REDOUBT



Scale, 24 Feet to 1 Inch

## ATTACK ON THE GRAVITZA RECOUBT

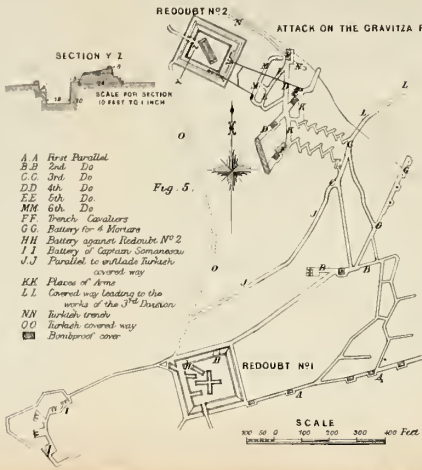


Fig. 5.

Fig. 6.  
ATTACK ON THE GRAVITZA REDOUBT

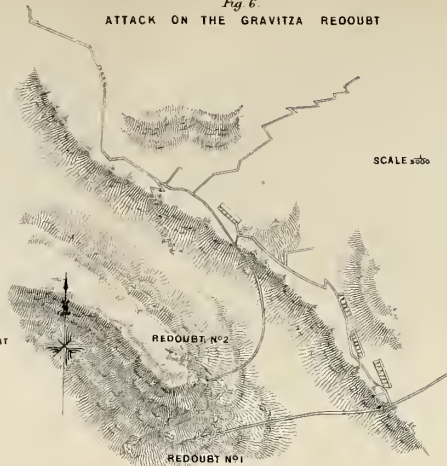
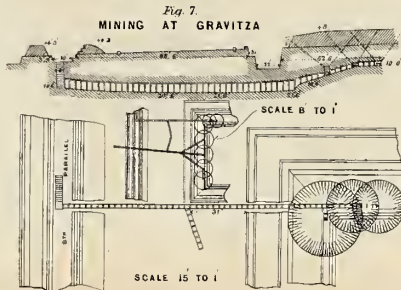
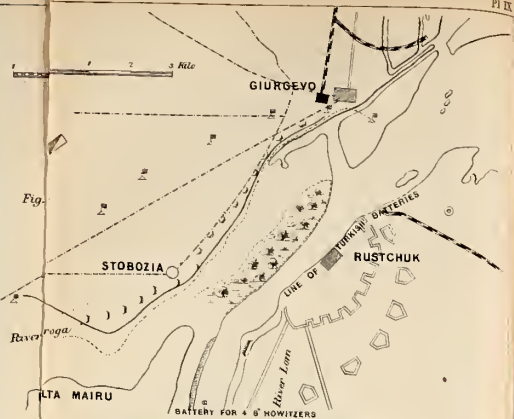


Fig. 7.  
MINING AT GRAVITZA



SCALE 15 TO 1

Fig.



Fig

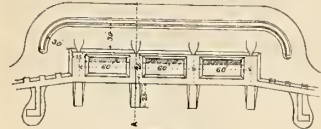
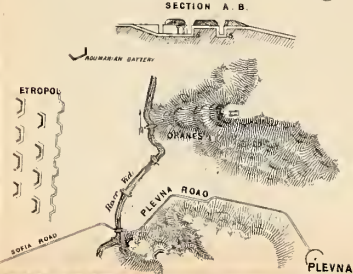


Fig.



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chesses, which were held down by ribands of all lengths and sizes. The rack lashings were all makeshift ones, rotten ends of rope for the most part; a few deal stanchions with single rope formed a rail. In every second boat was a small telegraph post, which supported a single wire from the front. The bridge was just sufficiently wide for a cart. At each end was a Dorobantz guard; a Dorobantz means a Roumanian militia man, or, to be more particular, one belonging to the Roumanian Territorial Army. The duty of the guard was to look after the bridge, to let no one on to it as long as the red flag flew at the other end, and of course to allow no one across without a pass. The red flag was used to show that traffic at the time was going on from the side on which the flag was, to the other. At each end of the bridge was a sentry box, that is worthy of notice, made like an enormous gabion, the work being carried up higher in front where the door was so as to get a slope to the roof, which consisted of a hurdle, covered over about a spade deep with earth. The defects of the bridge seemed to be the tightness of the iron bars round the road-bearers, the useless length the road-bearers overlapped, which increased their leverage, one against the other, the short length of the cables, which fastened the boats so tightly down that they lost their buoyancy, and above all the boats not being decked. This was the bridge the Roumanians put their faith in; not only that, but on many occasions it was spoken of in the highest terms in my hearing.

We now come to the military uses for which it was built. It was the main thoroughfare for all the Roumanian forces, and for some of the Russian going to the front at Plevna. All the bread for both Russians and Roumanians was baked in Turnu Magurelle, and crossed this bridge in carts. All Roumanian and some Russian ammunition passed this way. Forage the same. Empty carts, carts full of sick and wounded, made the return journey. On Thursday, 6th December, this bridge came to somewhat serious grief; 16 boats were sunk, some 16 others were more or less wrecked, and with them, of course, the roadway they supported. The disaster came about in this wise. A strong easterly wind blowing against the stream brought up a nasty chopping sea, that the day before dragged an anchor or two, and stopped traffic for a few hours. The following night it blew hard from the same quarter; the waves became so large that they got into 16 boats, and sunk them at their moorings. On going to the spot in the morning we traversed 55 boats, which, twisting about, were doing their best to get loose. The distance from the shore to where the bridge ceased to be one, was a quarter of a mile exactly. The scene reminded one of the old print of the flagship at Trafalgar, surrounded by half-sunk boats, rafts, and beams of wood. Some clear spaces in the troubled waters showed where the pontoons had sunk entirely, then for about 200 yards were boats, trestles, superstructure, in every conceivable state of wreck. Every now and then the light spars that carried the single telegraph wire from the front bobbed their heads helplessly above the water. The iron bands that grasped the road-bearers and transoms had proved themselves weak, the leverage



brought to bear on them by the road-bearers snapping them in every direction. The movement in that part of the bridge still holding together had in many places been violent enough to break the rack lashings, force up the roadway, and move the ponderous road-bearers, loosened from the iron clasp, along the transoms.

On looking around to see what steps were being taken towards mending the broken and securing the intact part of the bridge, I found half-a-dozen Roumanian soldiers seated on the boat next the broken part, who must evidently have been there for some purpose, as no one could have chosen the centre of the Danube in a cold easterly gale on a dangerous bridge without an object. Three steam launches with steam up were also on the river, that could easily have been made of use in towing away some of the wreck, especially some of the large part of the superstructure, which, floating raft-like on the water, was gyrating wildly about, to the danger of the unsunk but disabled pontoons. On coming off the bridge, an Officer informed us that there was too much sea on for any repairs to be made. Drawn up on the wrong side of the river were about 200 carts full of bread, which the Roumanians and Russians at Plevna in the ordinary course of things would have eaten two days afterwards.

The allies at no time were able to collect more than two or three days' supplies, and were as a rule only just able to get enough to the front for daily consumption. The breaking of the bridge occurred on the 6th; no bread left till the 10th, as a fact the allies had only a small allowance of biscuit on the 8th, 9th, and 10th. This reacted on the Turkish prisoners.

On the 8th, the water having become calmer, communications were again established in a small degree. Two pontoons with the portion of roadway between them still on the trestles, were detached from the remains of the bridge, a man with an oar was put in the stern of each to steer, a steam tug took the contrivance when heavily laden with a couple of carts in tow, and laboured over to the other side. An Officer was in charge of the landing stage. The progress of the course was slow, but was rendered still slower by the want of proper arrangements. The small landing stage made of the superstructure of the bridge was a foot lower than the raft moored alongside it; both were so made that they could not get quite close together, but a space was left between them just large enough for a horse or bullock to get his leg in. The minutes lost from this cause alone would, if added together, have made many an hour; a few planks, a couple of fascines, and a little earth would have remedied it. The boards of the raft and platform were not covered in any way, so time was also lost in inducing the beasts to face them. Everybody was allowed to crowd round the landing, carters fought for first place, everybody lost their tempers. The same landing place was used for both embarking and disembarking, causing double traffic over the soft earth. So eager was everyone to get over, that the carts closed on the landing stage, leaving no room for the disembarking carts to get off. In all this confusion, occurred a scene which shows the stuff a Russian private soldier is made of. I had noticed a Russian driving a Commissariat cart on



account of the successful way in which he was gradually working towards the landing stage. He succeeded in getting as far as the stage long before his proper turn, but was here stopped by the Dorobantz sentry. He tried to force by, the sentry tried to stop him; the sergeant of the guard appeared and eventually struck the Russian, who struck back with his whip. Four or five of the guard set upon the one man, he was hit on the head, banged in the back, knocked from one end of the long box seat to the other. All this time his left hand never left his reins, regardless of the punishment he received; he still found time to give his horses a whack between the strokes he dealt evenly round to his enemies, and eventually, in spite of all of them, he and his cart were on the landing stage. A bayonet had been placed at the Russian's chest, and things were beginning to look serious, when a Russian Officer pushed through the crowd, shook his whip in the face of the Roumanian under Officer of the guard, commanded the Russian cart to be taken across first, and thus order was restored. The Russian private soldier put his cap straight, never even looked at his late opponents, and went on to the rafts as if being knocked about by five men was what he was daily used to.

There are four salient points in the character of the Russian private soldier that were forced on us whilst journeying backwards and forwards on the road between Turnu Magurelle and the Plevna front. Two moral, viz. :—1st. His capacity for hero worship. 2nd. His idea that he was on a crusade. Two physical: 1st. His patient endurance. 2nd. His love for drink.

*v. p.*  
*382.* His idol when I saw him was General Skobelev the younger. If ever Napoleon's calculation that moral is to physical force as nine to one is to receive exemplification in the immediate future of the Russian Army, one may look to Skobelev as the man that will furnish the example. Meet a soldier on the road, he does not ask you news of the Russian Army, or the movements of the Grand Duke. It was, Has Skobelev taken Plevna? In this one question is embodied the greatest difficulty that a military commander ever had to solve. So thinks the Russian; but not for a moment does he doubt that young Skobelev can do it. It is always Skobelev; their dull faces light up, and they linger fondly over the name as they say it. Having once spoken to a man who had served under him, you do not want to see him to know he is a true leader of men. You must remember that this was no General who had made himself popular or earned a lucky name by his successes. At this time the world was still ringing with the bloody defeat this very man had undergone; how he went into action with 12,000 men and came out with 4,000.

Besides his hero worship, there is another moral force that helps on the soldier. In the early part of the war we were told of the Cossacks' wonder when he saw the rich surroundings of the people he came to emancipate from slavery. Since then, many new Russian forces have arrived, and in place of finding smiling cornfields and vineyards to march through, are snow plains and hills. The Bulgars' cattle are sold, their horses working at carting stores, so the simple Russian, ignorant of the gold pieces in the Bulgar's belt and seeing his apparent

poverty, is again beginning to believe he is on a crusade. The feeling is not confined to the men. I spoke on this subject to a young cavalry Officer at Giurgevo on the 3rd of January. He raised his cap from his head and reverently and in all sincerity prayed that God would give them strength to free the poor Bulgars from the hated tyranny of the Turks. The real truth of the conditions under which the Bulgarians and Turks are, is of no military importance, but it is of military importance that this feeling should be fostered, and this is done.

To give you an instance of the patient endurance of the private soldier. I never saw so patient a man. We had arrived at the Tartar village marked Debova, half-way between Turnu Magurelle and Poradim; it had rained all day, the muddy tracks—you cannot call them roads—were ankle deep, and in places knee deep in mud; bullock carts and Commissariat waggons took double teams to move them over the worst parts. You arrive at some idea of the badness of the roads by what a Commissariat Officer told me on the 27th November, that of 100 empty waggons sent from Plevna three days before, only thirty-six had arrived at Turnu Magurelle, the rest breaking down. The distance is 22 miles measured in a straight line on the map to Poradim from Turnu.

A soldier came dripping into the Tartar hut where we were. He met with rather a cold reception from the Mussulmans and our Turco-phile interpreter, but was allowed to sit down, take off his boot and wrap the cloth that answers for a sock round his foot in a more comfortable manner. Where was he going? To Plevna. Where had he come from? Oh, from Nicopolis. He was wet through, wasn't he? Oh, yes, he was wet. What had he had to eat? Why his bread, of course. He'd got a bit of bread left; and out of his pocket he pulls a sodden lump of black bread as full of water as a sponge. Well, where was he going? He was going on. But where was he going to stop the night? Oh, anywhere on the road, he didn't know. By this time his boot was once more on his foot, his heavy pack on his shoulders, and with his rifle in his hand he had just reached the door. A gleam of intelligence shows on his stupid looking face, I hear the word Skobelev, and do not wait for the interpreter to tell me that the usual question has been put, Has Skobelev taken Plevna?

*Love of Drink.*—Fortunately for the Russian army, drink was not obtainable on this road. This seems the great defect this patient man has; he drinks when he gets the chance. I saw many drunk in Turnu Magurelle, but none nearer the front; the Officers make no excuse for it, but take it as a matter of course that their men should get drunk whenever they get the chance; in fact, want of sobriety seems to carry but little reproach with it in much higher circles than that from which the Russian private soldier comes.

On our way out of Turnu Magurelle one day, we found a guard on some carts just starting for the front; one of their number was drunk, and they were employed in tying him on the top of a load of bread in a calm business-like way; one remarking that no doubt the jolting would sober him; in fact Punch's story here holds sway: "I wish I

"had half his complaint," would fitly describe the way a drunken soldier is looked on by his comrades. So great is the craving for drink, that the men consume a compound called "spiritus." Spirits of wine of the vilest sort would be the English equivalent.

*Want of Officer's Supervision on the Road to Plevna Front.*—To the question which no doubt has crossed your minds, how it is that single men were strolling about a road, I can give you no satisfactory answer. Between Nicopolis and the lines round Plevna there seemed to be nobody in charge of the road. You met Officers, of course, but each had his own business to attend to. At the sides of the road there were Red Cross hospitals, and now and then places for stores. Quartermasters, Paymasters, and doctors at each. You met private soldiers, sometimes singly, sometimes in twos and threes, plodding steadily through the mud under no control. This want of Officer's supervision acted badly in delaying provisions on their way to the front. If a cart broke down, nobody had authority enough to pitch it bodily on one side and let the string behind pass. Probably the whole *cortège* would be glad enough to have a halt, and thus valuable time was lost. I have given the Russian soldier all credit for his patient qualities, but, like most passive qualities, it betokens a want of individual energy, the sentry in charge of carts sitting down quite as often as the Bulgar driver. Besides this want of supervision and bad roads, another great cause of stoppage was that the only way across the Osma, a sluggish, deep river, about 30 yards wide, flowing between steep banks 8 or 10 feet high, was a narrow high pitched stone bridge, with no room for two carts to pass. The ground at each side of the bridge was soft and marshy, and here it was that we realised the possibility of the story told us of a pony being drowned in mud. However much the carts diverged from the track in other places, here they were obliged to pass the bridge and to struggle through the deep mud. The dead ponies and cattle that lined both the approaches to it, showed how severe was the task. The thought of putting two or three bridges across seems never to have occurred to anybody.

*Round Plevna. Hospitality.*—Our first experience of the front was one of hospitality, quite Arab in its perfectness. The 29th we spent in a hut at Verbitza, the Roumanian head-quarters. The talk here naturally turned to the war, being specially directed to Gravitz and the state of starvation Plevna was reduced to. In talking about Gravitz, I may mention as an example of want of technical knowledge, that a Staff Officer having drawn a profile of Gravitz Redoubt No. 2, failed to complete a plan from the profile. You must remember that this was on the 29th of November, when the siege had been going on for some time, and men's minds had been specially directed to the engineering part of soldiering. That very night we were fortunate enough to hear what musketry fire round Plevna was like. All day long the air had been filled with the incessant shrieking of shells, 400 guns constantly firing. At 9 o'clock we were startled by the sudden ceasing of the artillery. Everybody was outside their huts in a moment. There was a dense fog. Presently crack goes a rifle, one, two, three, dropping shots, and then to the south such a roll of musketry as I had



never before heard, extending quickly from a few hundred yards till at least two miles was covered by it.

"It's Gravitza," says an A.D.C. "No, it's Skobelev," says another; and presently they all agree it's the "Green Hill" that is the centre of it. We are by this time a knot of five or six, some putting on their swords and great coats as they join us, awakened by the sudden silence, as they say. Presently from the opposite side of Plevna, out by Sursulu, and down by the Vid, comes more musketry fire. "What a night for "Osman to break out," says one. A gasp of excitement goes round the circle that tells how well they know that some day soon there will be warm work for them. An Officer restlessly goes off to the telegraph office; back he comes—no news. Presently comes word that a *sortie* is going on; a few minutes more and it is again contradicted. For an hour we stand in the cold fog listening to the rattle, sometimes dying away only to break out again with greater fury. At 10 o'clock exactly, a flash comes through the fog; there is the report of a position-gun in front of us at Fort Alexander. An Officer near me touches his cap, and says quietly to himself, "Thank God;" and we all know the infantry are out of the way. A couple of minutes more and the big guns are once more fulfilling their useless mission of throwing numberless shells into the soft earth. Rifle firing of this sort was of constant occurrence. Why or how it began, nobody could make out. From the anxious way it seemed to be taken, it must have been a constant source of worry to the Roumanians. As I stood in the fog that night I could see there was a general feeling of distrust in their own arrangements. Perhaps distrust is too strong a word, a kind of feeling of not knowing what would turn up next.

Next day we were taken to see a prisoner as an example of the starved condition of the Turks. What I saw was a good-looking, thin, wiry man about 5 feet 9 inches; his clothes torn, and of much too light material for the time of year; altogether what I should call a man in hard training, fit in racing terms "to run for his life," and showing not a bit more signs of wear and tear about him than five or six weeks' hard campaigning would warrant.

As I have mentioned a hut, I give you the description of the invariable pattern both Russians and Roumanians used at the Plevna front. The two conditions under which the huts seem to have been made were:—1st, that wood was scarce; 2ndly, that the greatest warmth possible was desirable. The hut complied with both. Little wood was used. The hut was very warm. A square or oblong of ground is dug out to the depth of about 5 feet (Fig. 2), and of the size that the constructor wishes his hut to be. On one side of this square the earth is left of the height he prefers his bed, on the other side an earthen table and shelf. At one end the earth is cut away so as to form a ramp up to the level of the ground outside, or else steps are built. At each end are placed uprights which are connected by a cross-beam. On this cross-beam are placed one end of the rafters, the other resting on the ground level. Over the rafters are branches, then maize straw. On the top of all comes the earth that was taken out first.



There are often two stoves, one at each side of the room, made of clay. One or other of them is lit according to the direction of the wind. At the end where the ramp or steps are, comes the door, at the other, a small window with oiled paper for glass. On some of the huts their owners have expended a good deal of trouble, being prettily revetted all round with hurdle work; in one case the inside was covered with the canvas of a *tente d'abri* by way of paper, hurdle-work all round the bed, the steps, &c., the outside of the window, which was glazed, being finished off in imitation of a sand-bag battery.

The soldiers' hut (Fig. 3) was the same sort of thing, generally made to hold twenty men, with a place on each side of the steps made for arm-racks, and a raised platform on each side covered with straw for men to sleep on, ten on each side.

*Earthworks.*—The Turkish position of Plevna is something like a horseshoe (Fig. 10), having Opanes at one cog, and the batteries above the bridge at the other; Gravitz at its toe.

Speaking generally, the redoubts are all of earth, revetted outside with sods, inside with gabions, having low parapets and high traverses. Steps cut in the ditches. Very good shelters under the traverses. They are of all shapes, but all small; none have any flank defence.

In considering the Turkish works round Plevna—although the result is acknowledged by everybody to be grand—you can scarcely give the credit of this result to any one man. The earthworks grew after each successive Russian attack. Where the Turkish losses were greatest an earthwork appeared. In this way, one may say, the Russians, by their senseless assaults, taught the besieged their weak points. The Turks learnt the lesson very readily, and profited by it. The ground worked in is a heavy alluvial soil, without stones, that stands well at a very steep slope, even without revetting, and is very easy to dig. I propose to take examples of the work of each.

*Shahoffskay's Attack.*—You all remember Prince Shahoffskay's mad attack on Plevna on the 31st July, when finding Krudener on his right, unable to make any headway, he launched 12,000 men against a larger force safely stowed away in earthworks. The result was what the result only could be, his beaten remnant of an army came back to him a panic-stricken crowd. They were got together again on the line of hills that skirts the road running north of Poradim two days afterwards, and there put up earthworks. These works were never used, and may be looked upon as a truer test of Russian capabilities than any of the works round Plevna, which of course were improved from day to day. The work must have been done by tools requisitioned from the Bulgarians, the Russians having none with them at the time.

The gun-pits and epaulements are the same as ours; so good is the ground to work in, that the earth for the parapet of the epaulements was got in some cases from a small trench in front of it only, and this without revetting. The work is perfect and looks like a model. The trenches, though constructed in such haste, can scarcely be called shelter ones, being large, the biggest giving quite six feet of cover, a step being cut to stand on when firing, and having a parapet fit to

resist siege guns. Owing to the round form of the hills and the trench accurately following the same contour throughout, the enfiladed parts are protected by a still higher parapet.

The trench was placed in front of the gun-pits about 25 feet lower in point of contour, and about 100 yards in point of space.

The fidelity with which the trench runs in the same contour is very marked. Both Russians and Roumanians show a preference for rifle-pits to hold six or eight men over continuous trench. They give about 4' cover, are crescent-shaped, with the convex side towards the enemy. I thought at first that the preference of pits over trench was that their men having been lately beaten, they would be more likely to hold out longer in a pit, being loath to face the open, but I afterwards found they always preferred the pits. They were generally placed in three rows, with sufficient space between each row to allow those behind to have a clear front. I got into several pits and was astonished at the enormous range of fire they had. This is owing to the hills rising at the same gradient throughout and the grass being withered short.

In some of the early Roumanian work the trenches are fairly slight, giving in one instance about 3 feet of cover with no room for communication behind the firing rank. Originally, perhaps, this trench gave a little more cover, but the parapet had sunk down from the action of rain. In nearly all the works, even the smallest, fireplaces have been cut out of the parapet side of the ditch; in some instances the chimney coming out under the parapet, in others the smoke escapes straight up from the fire. The absence of hasty entrenchment (three minutes' work) is to be explained by the original entrenchments being improved upon as occasion required.

*Roumania.*—At Verbitza was a peculiar wall, about 6 feet high, loopholed; 4 feet thick at the bottom, 2 feet thick at top, made of sods, and about 400 yards long. It stood on the plateau at Verbitza, and had a clear, flat front of about  $\frac{1}{4}$  mile. It was supported by a few pits in echelon on each flank. The sods and earth composing it had been dug irregularly from the front of it; there was no attempt at a ditch. Some of the Roumanian works were of the Redan trace, consisting of two lines of parapet joining at an angle of  $120^\circ$ , with the ditch dug apparently only with the purpose of obtaining sufficient earth to make a 4-foot parapet.

In some of the Turkish works, steps have been cut out on the counter-scarp side of the ditch, as in the Gravitza; in others, as in Opanes, on both sides. They were accustomed to place men on these steps when expecting an attack, also in the bottom of the ditch. The Turks stuck to this plan always, I believe, and the Russians seem to have been unable to shell them out.

I propose to deal with only three redoubts, the two over which there was most fighting, the two Gravitzas, and the one that is considered the strongest point round Plevna, viz., Opanes. You have here a plan of Opanes (Fig. 4). All the shaded parts are perfect shell-proof underground quarters large enough to hold 300 men. I had an opportunity of seeing a section of these shelters as the Roumanians were

digging out the wooden rafters that held the roof for firewood. These rafters ran from the parapet, and the traverses that ran down the middle of the redoubt, and at right angles to them. They were in places kept up by perpendicular supports set in the floor of the shelter. From the irregular way the supports ran a good number of them had probably been used for firewood. The thickness of earth was from 3 to 4 feet. The way down was by stairs, as shown on diagram. This was considered the best bit of work round Plevna, and I felt flattered by being told an Englishman must have made it.

The ditch is about 12 feet by 10, getting deeper on the side marked A, and shallows to about 6 feet at B. The parapet, outside and in, is revetted with sods placed as regularly as bricks in a wall and nearly as perpendicularly. The traverses are revetted in the same way. The redoubt stands on the end of a spur that runs out over the Vid. The ground all round was scored with shell marks; there were also newly done-up places in the revetment, but none of them extending above a couple of feet, so great is the resistance the shells met with from the earth. The whole work looked trim and new; if it had not been for the old rags scattered everywhere about and a broken stretcher, the blackened bed of which showing how often it had been used, one would have thought it had never seen war. Just outside the redoubt stood a row of fourteen tombs, two deep, arranged with the greatest neatness, revetted with sods, and having a little parapet running round them. A likely spot for the position guns that were known to be in Opanes, but which have not been found by the Roumanians.

The end of the spur on which Opanes stands running out to a sharp point, the work does not quite cover all the ground, so a small redoubt with one gun was made a few yards down the slope. Some rifle-pits at the crest of the hill complete the work. This position with the works round it, eleven redoubts, is capable of defence by itself. It commands the Vid, the battlefield of the 10th, the valley of Plevna and Plevna itself, the Sofia road, the permanent bridge, the village of Opanes, and the redoubts to the north (Fig. 9).

The story of the taking of Opanes as I heard it, has never got into print. On the morning of the 10th the Roumanians occupied the village of Opanes, which is situate about two-thirds of the way down the slope that ends at the Vid, and on the top of which stands the fort. They pushed out of the village; two of the leading men, both Englishmen, finding the fire very hot, ran on and got to a dip in the hill by which they were safe from the fire from the rifle-pits. Two other men followed them. These four, when the fire slackened, again advanced, but once more being shot at, threw themselves down, holding the butts of their rifles in front of their heads, keeping their faces well pressed to the ground. Once again the fire stopped, and to their surprise a Turk with a white flag appeared. They jumped to their feet, called to their comrades in the village, and found about a couple of hundred Turks who wanted to lay down their arms and give up the key to Plevna. The same story was told me at two different times, in different places, and different language, but circumstantially the same. My informants were the two Englishmen I spoke of.



*Gravitza.*—For the plan of the two Gravitza redoubts and the Roumanian works round them you are indebted to my companion, Mr. Henry Shaw Kennedy, of the 41st Regiment (Figs. 5 and 6). The shape of the works are as they were on the day the sortie was made. The inside of No. 2 is 34 metres broad, 47 long, measuring from inside parapet, thickness of parapet  $4\frac{1}{4}$  metres, ditch 4. The parapet was inside strengthened with gabions, outside with sandbags, sandbags standing on the top of parapet, loopholed, and was repaired with sandbags, the traverses shaped as you see them, about 14 feet high; shelters under the traverses. It was connected with Plevna by a long covered way, running up to Buchova. The parapet of this covered way was full of dead bodies, slenderly covered with earth, which the shells were constantly exposing.

*No. 2 Gravitza.*—A redoubt about 52 metres square, measuring inside the parapet; traverses about 14 feet high; parapet of less height than the Turkish redoubt; ditch 4 metres; revetted with gabions inside; shelters under the traverses. It was connected to the left by a covered way to a battery of 10 guns. The Roumanians, after their unsuccessful assault, took to sapping; they made their first parallel AA. The shaded parts in this, as in the other trenches, are shelters. They then sapped up a distance of about 100 metres and made the second parallel B, and joined this by a covered way to the front face of the redoubt, thereby enfilading the old Turkish connection between the two redoubts. CC forms third parallel, DD fourth, GG fifth, MM sixth. This last brought them within 30 yards of the Turks. FF represent two-trench cavaliers, from which they could get a better view of the enemy. GG shows a trench they pushed out from the second parallel and in which trench they placed four mortars. H shows the battery in the redoubt which was directed against the Turks in No. 2, the distance it had to fire being about 250 yards. II shows a battery to the left which did not fire at Gravitza 2. II was a parallel thrown out from the third one to cut through the covered way that joined the two works when in Turkish hands. KK were places of assembly; LL was the covered way that joined the works here to that of the next division, the third. *aa* is an old Turkish trench. *bb* is the line of the valley.

The ground here dips, rising again to where the batteries shown on the other plan stand. The ground on which the two redoubts are is on a narrow spur running down into the valley at a small slope. No. 2 is situated almost at the top of this ledge, No. 1 about half way down. You must bear in mind the narrowness of this ledge, else you would naturally suppose the Roumanians would have sapped up to the angle instead of the side of the work. You can see the breadth of the hill by the breadth of the parallels. The top redoubt is most cunningly placed so as to take full advantage of the commanding situation. The work made here at Gravitza must be considered of great value. The ground certainly is easy to work in, but every inch of it was dug under fire, and that of the very hottest description. It rained hard at this time, and it was common for men to be brought out of the trenches, which were knee-deep in mud, with their legs and feet in a state resembling frost-



bite. The sapping was done by two men digging sufficiently deep to cover themselves, the ditch being taken out to its full proportions by those behind them. The Roumanians, not content with sapping, took to mining, and drove a shaft from the point F and another from the M parallel. These were commenced in the trench and sunk to the depth shown in the plan. The powder was laid in three charges in the left gallery and four in the other, under the Turkish parapet, as marked in the plan. (Fig. 7.) The circles in red on the plan show what they expected the area of the crater of each mine would be. Calculating by the formula used by the R.E., the charges were probably from 350 to 500 lbs. You have also the profile of the mine sunk. The dotted line represents the ground level; the various numbers show the heights and depths above and below the ground. No. 3 plan shows what they hoped from both mines when exploded together. By this the whole side of the work should have been demolished, as shown by the circles. All the mining was finished some ten days before the sortie; the fuze was laid and all ready to be blown up in an instant; the Turks at this time expecting to be mined sunk a shaft in their front ditch, hoping to come on the Roumanian mine if there was any. An Officer who had gone into the mine told me he could hear digging above him. Anyhow, the Turks did not find their enemy's work.

The question, I have no doubt, has already been mentally asked by you, Why was not the mine sprung and the attack made? The reasons for the attack were many:—

1st. The Roumanian troops had always shown the greatest courage in their assaults.

2nd. They had successfully sapped up to within 30 yards of their enemy.

3rd. They had as big a front as he had to deploy.

4th. Their powers of bringing up men to the front were as good through their trenches as that of the Turks through their long communication to Buchova.

5th. If the mine acted anything like what they expected it to do, the Turkish fire would be deranged sufficiently for the first rush to get over almost unscathed.

6th. They had the moral advantage of being the attacking party.

Against them was the general belief that the Turkish redoubt was mined throughout, and that they, the Roumanians, would be blown sky-high the moment they found themselves masters of it. I have said that the power of bringing up men to the front was as much in favour of the Roumanians as the Turks; by this I do not mean to say that they had as many men there originally. Besides the Turks inside the redoubt, the ditches were filled by them and this in spite of the Roumanian guns and mortars far and near. There were many hot arguments on the spot as to why Gravitz No. 2 was not taken, but none appear conclusive, unless we believe that the Russians meant to have another general attack on Plevna, and that this mine was kept for that occasion. Musketry fire generally went on night and day here; it was a common saying that any man wanting to malingering had only to hold up his little finger above the parapet and

it would soon be shot off for him. Not that the shooting was particularly straight, but calculating that there were so many bullets to the square foot flying about. When talking of those spots, where rifle-fire of the hottest sort was of daily occurrence, such as here at Gravitza, or on the Green Hill with Skobelev, the question is forced on one, Has any lesson been taught us on the subject of random and straight shooting? Here was every reason to expect good shooting. Men going on duty at the same spot, firing at the same ranges and over the same ground day after day, and yet the shooting was not good. Both Russians and Roumanians seem to have taken it for granted, that there should be an indiscriminate blaze at nothing on occasions; and the Turks, judging by their practice, laid it down as a rule, that certain ground was to be swept with bullets, and so kept shooting over it whether any one was on it or not. I could hear of no case where one or two men have stood their ground against superior numbers in virtue of good shooting. A Turk went into the trenches with ammunition in his pouches, and in his pockets, and in the breast of his coat were little places made to hold cartridges after the manner of a Circassian. In his hand he carried a handkerchief or small sack filled with cartridges. With regard to the weapon, he used the Martini-Peabody. The distance it carries is marvellous, bullets were dug out of a hard clay threshing-floor from a depth of 6 inches at a distance of 2,000 yards from the nearest Turkish post. The weight of powder used is the same as ours, quality much the same, except that it has not so fine a glaze on it and it is consequently more liable to damp. The bullet weighs the same as that of the Henry-Martini, but it is of slightly less diameter and is a little longer. The allies soon found out that the Martini-Peabody was better than the Peabody, the Kranke, or Berdan, but the rifle above all others that they had the highest opinion of was the Winchester repeating rifle. So much did they think of it, that I have heard both Russians and Roumanians say that they considered a front attack against men armed with Winchesters hopeless. They looked on it as we have been taught to value a Gatling gun in a street or at a bridge head. I have it on the authority of an American General who supplied the Turks with ammunition that they had expended 240,000,000 rounds up to the fall of Plevna. There seems to have been no attempt made here or elsewhere of artificial obstacles by wire entanglement or other means.

The only occasion of using a light was when Skobelev showed an illumination with "Kars is taken," in Turkish characters; this was shelled and shot to pieces in a very few minutes. I was told that the Russians had some sort of lime-light apparatus with them, which they intended to use in the event of a night sortie, but that the idea was abandoned on discovering how short a time the light would probably burn before being destroyed.

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Wednesday, February 20th, 1878.

LIEUT.-GENERAL BEAUCHAMP WALKER, C.B., &c., &c.,  
in the Chair.

## PART II.

*Battle of Plevna.*—The horse-shoe shaped position of Plevna encloses the valley in which the Turks assembled prior to the sortie. A line drawn from Opanes to Plevna and from Plevna to the stone bridge shows two sides of the valley, the third is bounded by the Vid. Across the Vid to the west is a plain as level as a race-course; beyond this there is a slight rise up to the batteries in front of Etropol. It was on this plain and on this rise that the battle was fought. Across this plain about  $1\frac{1}{2}$  miles from the Vid runs the Russian infantry trench, further back a line of batteries, and behind them another. (Fig. 10.)

These three lines curve round, meeting the Roumanian lines that run from Sussulu and joining to Skobelev's position across the Vid some 3 miles up stream. What actual number of guns were brought to bear by the Russians on the 10th I do not know; but 10 days before the sortie, the weakest spot by the Sofia road was swept by a converging fire of 62 guns.

As to what occurred in Plevna before the sortie, one of course has to depend on the evidence of the Turks. Mr. Kennedy had much conversation with Edhem Pasha, and this is his account, considerably condensed, of what took place at and immediately before the battle.

Shortly previous to the sortie a council of war was held, consisting of eight Pashas and the civil powers. Osman Pasha informed them that his store of bread was coming to an end, and that very little big gun ammunition was left. It was for them to decide whether they should lay down their arms or make a sortie in the only practicable place, across the Vid north of the Sofia road. The sortie was decided on. On the night of the 9th, 32,000 Turks, all the available force except a skeleton garrison for some of the redoubts, assembled in the valley of Plevna—26,000 infantry, 6,000 artillery. At two o'clock, this army commenced crossing the Vid by five bridges, viz., the permanent stone, and four temporary ones. The temporary bridges were placed, one just up stream to the south of the stone bridge, the other three dividing the distance between the stone bridge and a line drawn from Opanes fort straight to the river. As the regiments crossed the Vid they deployed into line, and they did this in so orderly a manner that the Cossack vedettes, who were but 300 yards away, were not aware of their vicinity till the skirmishers of the Turks advanced to within 100 yards of them. The Cossacks then retired firing. At this time the position of the Turkish forces was as follows:—1st, a line of skirmishers; 2nd, a line of battalions in line; 3rd, three guns in rear of right of line of infantry; three ditto centre ditto; three ditto left ditto. These guns were not used till after passing the first Russian



line. The Turks depended on one gun in the small bastion below Opanes redoubt, five on the south slope of the Opanes redoubt, these constituting the right of the Turkish attack; eleven guns in two batteries on the high ground on the Plevna side of the permanent bridge, these constituting the left of the Turkish attack. The positions of the Turkish Generals were as follows:—Commencing from the rear of the army one Pasha was on the high ground above the bridge with the eleven guns I have mentioned; one on the right, with the six guns on the slope of Opanes; two in the plain below superintending the crossing. On the right of the attacking line was one Pasha; in the centre, one; on the left, were two and Osman Pasha. As the attacking line advanced, carts containing ammunition and necessary baggage crossed the permanent bridge, and with them numbers of carts belonging to the inhabitants of Plevna, and containing their wives, children, and household goods, in all to the number of 4,000, pressed forward, and crossed as fast as possible. These latter Osman Pasha was powerless to prevent crossing, for as soon as his troops were withdrawn from Plevna they insisted on following. At daybreak, a little before eight, the fighting began. The bridge was swept by the Russian artillery, killing men, women, and children, horses and oxen. At nine, No. 2 bridge, counting the bridge below Opanes as No. 1, was broken by the Roumanian battery of five guns, situated to the right of the Turkish attack. The Turks steadily advanced, and carried the first Russian lines. Again they advanced, and carried two batteries of six guns each in the second line. For two hours the fight raged between the second and third line of the Russians in favour of neither side. At this critical time the Turkish shells ran short; this enabled the Roumanians to turn their left flank, to get possession of Opanes, and the hard-fought day was decided against the Turks. Osman Pasha was wounded in the leg, the same bullet killing his horse, a present from the Sultan. Ten thousand Turks had not crossed the Vid when they laid down their arms.

The first part of this account is evidently a repetition of the orders issued, showing how the attack was to be conducted. The reason given that the Turkish shells running short affected the issue of the battle can scarcely hold water, seeing how little shells from position-guns safely established in batteries, were able to effect during the siege, it is not likely that a few field guns which the Turks admit did not fire till they were past the first Russian lines could do much harm to the Russian guns or men in position.

When the Turks got to the furthest point to which they were able to carry the advance, Edhem Pasha says the fight raged for two hours, without favour to either side. How true this was that the fight raged fiercely, is proved by the fact that of the garrison of the two batteries taken by the Turks, not a Russian was left alive; they died like brave men, fighting for their guns. Long after the Turks were forced to retire, fighting went on, the Turks retiring to the high bank of the Vid, and there keeping up rifle fire. I think we may safely say that the battle must have been virtually over when the Turk appeared with the flag of truce at Opanes. And now to mark the progress of the battle



by the tokens left on the field. The plain between Plevna and the Vid was strewn with accoutrements, arms, knapsacks, ammunition, both for rifle and big gun. Many dead horses and a few dead men, principally those who had been wounded in the sortie, and in dragging themselves back towards Plevna, had succumbed on the way. A handful of parched grain thrown on the ground beside an open cartridge-pouch showed where each Turk had literally thrown down his arms. The amount of ammunition, according to the orders issued, to be carried by each Turk at the sortie was 90 rounds, but many carried a great deal more, judging from the ammunition thrown away. There were havresacks, pocket-handkerchiefs, cartridge belts, lying about filled with cartridges, besides the regulation pouches. The effect of the breaking of the bridge was most disastrous to the Turks. Judging by the way the killed lay, the extra work seems to have been thrown on the bridge lowest down stream, the result being that they do not seem to have deployed again properly, but became massed on the right of the line. When the Turks got to within 500 yards of the two batteries they took later in the day, the shrapnel and shell began to tell fearfully. Groups of dead, of 20 or 30, mark their advance, seemingly all killed by the same discharge. The ground everywhere was scored with shell marks, but the places where they told most was on the right, where the troops were massed; and on the left, where the shell had hard ground to burst on, viz., the road and stone bridge. The number of dead was increased here by the drivers and occupants of carts that were on the road.

Whatever may be the opinion about shells *versus* earthworks, there can be no doubt of the terrible execution wrought on men in the open, when massed together, and nowhere can a lesson of the value of steady drill be found than here. Troops in the open attacking men in earthworks, packed so tightly as to be unable to use their rifle fire, and with not sufficient drill power among them to deploy, and so remedy the harm worked by the one lucky Roumanian shell that broke the bridge.

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*Giurgevo and Ruschuck* (See Fig. 8).—The town of Giurgevo has been very much knocked about by shells, and offers a good study of the effects of shell-fire on different materials. Where small mud hovels have been struck, scarcely any damage has been done, the shell having passed through the slender wall or roof, and not exploded till buried in the ground. Among the larger and more solidly-built structures are numerous examples of shell power. Notably in the case of a school, a large white building, standing on the high ground above the Danube; some 15 or 16 shots have completely wrecked it. 100 yards or so off is a quadrangle, the entrance to which is through an archway, rendered massive by the large timbers that support a room overhead. One shell passing through this room had burst on the centre of the arch, the whole of the timbers had been splintered, leaving an oval-shaped hole, about 10 feet in length and 6 feet broad.

Emerging from the town the high road runs westward, on an em-

bankment by the Danube, towards Slabosia. A chain of sentries showed clearly out, black patches on the snow. In rear of them at intervals are three rifles, with fixed bayonets, piled, apparently put out to take care of themselves in the open plain. As we approach the first pile, out pops a soldier's head from the ground, and we find each relief has got a cunningly constructed underground shelter, not very large, certainly, but, what is of more importance, very warm. Most of these shelters have been dug out of the reverse slope of a small bank, but some are in the open, and are made somewhat like the huts I have already described, the earth being dug out, a few beams placed across the hole thus made, branches on the beams, maize stalks on the branches, and the dug-out earth on the top; the earth is dug away on the reverse side sufficiently to admit of steps or a ramp leading down to the shelter; in the door is a bit of oiled paper for a window; the chimney is of clay.

All signs of these shelters had been obliterated by the 3 feet of snow that covered everything. The snow had completely changed the appearance of the batteries. The lines of the parapet and embrasures were all so toned down that one scarcely recognised them, and if it had not been for the well-swept paths and gun platforms, you might have walked into a battery before you knew of its existence. Approached from the other side, that is the front, you saw what appeared to be a gently sloping snow-covered hill. We went straight through the battery, and on the crest of the parapet on the extreme right front we are shown a little hole, about 3 feet deep. "My post," says the Colonel, "this is where I always sit when important firing is 'going on.'"

We were in the centre of a line of 64 guns, 16 batteries of 4 guns each. (Fig. 8.) Battery No. 7 was the most advanced one; those on the right and left bending gradually back, following the turn of the Danube. The distance hence to the nearest Turkish battery was 2,000 metres. It seemed less, the mosques, minarets, and big buildings standing out clearly, though the day was far from a bright one, and the sounds of dogs barking and men shouting, came plainly across the water. I was told they could sometimes hear the word of command to fire in the Turkish battery opposite. Immediately below the line of Russian batteries which occupy the high ground was a shallow stream, frozen over, part of the Danube. Further towards Ruschuck was an island about 5 kilometres long. This was covered with wood, was always marshy, and in floods inundated. Behind this comes the Danube proper, a swift running stream, 600 yards broad. On the Ruschuck side, the ground rises suddenly from the water's edge, so the Turkish batteries are for the most part close to the river. On the south-west of the town the cliffs rise almost precipitously, and on this high ground were two batteries of field artillery, which have done the Turks good service.

The Russian Officers said that the straight shooting of these guns was marvellous, and they were naturally curious to know who commanded them. One reason why these light guns were felt by the Russians was that their central battery was pushed very far forward

indeed, so as to get to the extreme limit of the high ground, consequently the two Turkish field batteries took it almost in flank. There was a shell crater inside the parapet, and just above a gun in No. 7 Battery, which showed from the angle at which the shot had struck that the battery was too far out of the general line. With regard to the shooting of the Turkish artillery generally, the difference on different days was very marked, sometimes very wild, and on occasions very accurate. This pointed to their being some good Officer who occasionally directed. The Russian shooting had been very good. They put up a battery at Giurgevo to keep down the fire of the "Round Battery," the extreme right battery of the Turkish position, which had been doing a good deal of harm in the town of Giurgevo, and in one day dismounted its guns, and gave the Turks so good an opinion of their skill, that the round battery was not again occupied. The Turks also had a screened battery. A lucky Russian shell set the screen on fire, and burnt it down. This burning, however, proved a doubtful advantage, as the Turks fired away from the opened battery. The Russian guns comprised 8-inch howitzers, 6-inch steel guns, and 6-inch bronze guns, all breech-loading. The howitzers were sighted by means of a quadrant placed on the trunnion of the gun. The 6-inch guns were furnished with range-finders, and were sighted at the side. The way these guns were kept was beyond all praise. One man moved the massive breech-block of the howitzer, the smooth polished cartridge chamber and the rifled part of the barrel shone like silver, and were as clean as they could be. The moment a gun was cleaned after cease firing sounded, a waterproof tarred canvas case was put on it, and a stopper placed on the muzzle to keep out the damp. The Officer commanding considered his 8-inch howitzer the best gun in the world of its sort. His opinion is one of weight. For four years he worked at Birmingham, for two years in America, in peace-time he is the head of a steam engine and gun factory in Siberia, and now, once more called upon to serve, he became a leader of men, and as good at practice in war as at theories in peace-time. The range of his guns, he said, nobody knew. The 6-inch bronze gun especially would carry marvellous distances. The Russians were only using percussion shells. There was an array of Turkish ones that had been picked up unexploded, and had their charges drawn, mostly percussion, but a few time-fuze. Some very much out-of-date ones were fired off at the commencement of the bombardment, and were evidently got rid of as fast as possible. When I was there, the Turks were mostly firing Krupp shells of smaller calibre than those used by the Russians. This, however, was no proof that they had no larger guns because they had not fired them off, and it is quite possible that inside Ruschuck have been found 8-inch guns placed where one would expect to find them, viz., on the weakest side of the town, that is, provided they have not buried them, as they did some position guns at Plevna. The central Battery No. 7 was a "sunk" one of four 8-inch howitzers (Fig. 9). The four guns were placed on platforms about 5 feet below the general level of the ground, and about 20 yards apart; between each gun was left a solid ridge of earth as a



traverse. This traverse, if necessary, was built up to 12 or 14 feet high, revetted with sods. Beneath the traverses were shelters and magazines for a few rounds only. The inside of the embrasures and gun-pit, and lower part of traverses were revetted with hurdle-work very neatly put together, the stakes used being quite 2 inches in diameter. The hurdle-work was carried up to a height of nearly 5 feet. Around each traverse, and in all places where men had to move, trenches were cut about 5 feet deep, so as to ensure as much as possible the safety of all. In front and on the flanks of the line in which the guns stood, and at a distance of about 120 yards, was a solid earthen parapet about 20 feet thick, revetted with gabions; this acted as a screen. The ditch between the parapet and the sunk pits in which stood the guns, was cut down perfectly straight with steps cut in places to get down by. Aim was taken by small pointed sticks placed in the ground on the crest of the parapet. The trench that ran round the traverses was continued beyond the outer gun of each battery, and on the side of the trench next the front, were dug little cabins. These being dug out of the solid earth were, of course, perfectly safe. The only difference between the howitzer batteries and the 6-inch ones was that the embrasures of the latter were a little more cut away. There were always three look-out men when firing was going on; one with a telescope on a tripod to note the effect of the shots of his own battery; one to watch the jets of smoke from the battery opposed to it, so as to give timely notice of the coming shell, and the usual sentry to keep everybody out of the way except those on duty. The effect of these men really doing what they were set to do, and the effect of keeping every man not on duty under cover, was that the Russian losses were wonderfully small, 24 killed. The number of wounded I could not find out.

The distance the 16 batteries were spread over, was 13 kilometres ( $8\frac{1}{10}$  miles).

Coming back to our standpoint at No. 7 Battery, we have 4 miles occupied by guns on each side. In front, and close to, is a line of pickets and sentries, further on, at the edge of the wood, is another line; again, nearer Ruschuck on the river bank, is the third and most advanced line. Behind us, in a circle that runs to the front of Giurgevo on the one side, to the end of the line of guns at the other, are tall poles standing in twos, placed in the best positions for being seen. Round these poles are twisted tarred straw bands; these are the beacon posts. Behind again, and at a distance of 4 miles, is the reserve, a regular little army—

Of 4 infantry battalions, say .....	750 = 3,000
„ 2 cavalry „ .....	600 = 1,200
„ 2 batteries field artillery, 8 guns each ..	..
„ 1 company engineers, 100 men .. ..	100

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4,300

4,300 men and 16 guns.

The order for the commander of the beacon posts was to light his beacon if the enemy approached, so that the reserve could get quickly



up to the right spot. The posts were probably put up in anticipation of Turkish raids when the Danube was frozen over. The fighting, as it then was, consisted generally of a duel between two batteries, the Russians always beginning it, and the Turks replying shot for shot. The latter also got through a certain amount of rifle ammunition, firing across the river at the sentries; they also occasionally fired canister at the soldiers sent to cut wood on the island. I watched the bombardment from a very good position, where I could see the effect of shells from both sides. The practice was certainly very good, especially that of the Turks, shells frequently catching just the crest of the parapet. I also went down to the river, and had a good look at the Turkish line of sentries through a glass, and came to the conclusion from their movements that they were short of clothes. I watched several of them that lined the curved river bank down stream of Ruschuck, and every one of these men betrayed symptoms of cold. I then looked at the Russian lines, and found the men walking about in their usual leisurely fashion. The importance of this cannot be overrated. One man comes off his post fresh and well, ready to eat, sleep, and be watchful again; the other has to contend with a regular drain on his constitution, and every fresh exposure renders him less able to bear the next, till at last you heard of a case such as was reported the day I arrived at Giurgevo, a Turkish outpost of eight men frozen to death.

And now a word about a Russian soldier's clothes.

His sheepskin coat with the wool inside is slit down at the neck sufficiently far for him to pull it on, this slit buttoning up high when on. It fits him tight about the waist, the skirts made like those of a frock coat reach to the calf of his leg. His boots, particularly well made, reach above his knees. His gloves are good warm woollen ones, but with only a thumb to them, the place for his fingers being a kind of bag. Instead of socks, he has a triangular shaped piece of canvas stuff that he rolls round his foot, this in spite of the clumsiness of its appearance seems to answer well. I could find no men suffering from sore feet. I must add, however, that most troops at this time were stationary, so my experience is not worth much. The garment above all others that he seems to value most is his hood. This hood has long ends to it, and is made of a thick, soft, warm stuff, brown in colour, having the appearance of felt. Its uses are numerous. The soldier uses it as a comforter, the two long ends coming under his arms and tied round his waist. Getting a little colder he folds the hood flat and puts the garment on so that the flat hood stands up at the back of his head and protects his ears, the ends still being long enough to tie round his waist. Lastly, he puts the hood on, brings the ends twice round his neck and ties them there; in this state you have to bend down to about his waist belt and look upwards if you want to see his face at all.

*Condition of Transport between Bucharest and Sistova on 8th January, when the Danube was full of ice but not frozen over.*

After the breaking of the bridges between Sistova and Zimnitsa,

communication was kept up by pontoons rowed by sailors. The river was full of ice, which rendered this service a dangerous one. Seventeen persons were drowned on the 8th attempting the passage in a private boat. The trip formerly occupying about 15 to 30 minutes took then from one to three hours, sometimes even longer. The pontoons were crowded with Officers on duty, and deeply laden with money in boxes and sheepskin coats. No other goods were taken. On 6th and 7th January, fog interrupted this traffic, and it was often interrupted by the same cause. What everybody hoped for was hard frost to freeze the Danube over, and so allow of the full passage of the stores the Russian Army so urgently needed. Enormous quantities of provisions and clothing were stacked in Zimnitza, carts daily arriving with more. Hay was not to be bought; the draft cattle fed alone on Indian corn died in great numbers, and the difficulties, always great of transporting supplies from the railway at Frateshti and Giurgevo, were increased greatly by this cause alone? The principle upon which animals were worked here was simply to work them to death. Every street and lane in Zimnitza was strewn with dead ponies and bullocks; ponies mere skin and bone, unable to do a day's more work, were turned adrift on the snow-covered plain to meet a certain, cruel, lingering death. The question arose, whence are the ranks daily thinned of draught cattle, to be filled. Carts from all the surrounding countries were then to be seen in Zimnitza. Bulgaria, Bessarabia, Hungaria, Wallachia, Moldavia, were all represented by both man and beast. Carters unable to fulfil their contracts of delivering their loads in Sistova, and ruined by the war prices, daily ran away, leaving the contractors under whom they worked, losers by reason of the large advances already made them. In the railway station at Bucharest at this time was an enormous number of sacks containing bread and biscuit. Sheepskin coats made in Russia for the army and sent away thence two months before, had not only not been delivered in Bucharest, but it was not known where they were, so great was the confusion. All these things had to be forwarded by the carts I have alluded to, as at Zimnitza or on the road between Frateshti and that place, or else by the new line of railway just constructed between these two places. With regard to the old railway that runs between Bucharest and Giurgevo, in two places it was so exposed, that the slightest wind drifted the snow over the line, and made it impassable. The engines were old, almost worn out, some of the worst having leaky boilers, so that in the distance to Frateshti from Bucharest, 35 miles, the engine has often to leave the train to go in search of water. The passenger train that left Bucharest for Frateshti at 9.30 A.M. on the 7th took 15 hours to do the journey. The train that left Giurgevo at 6 P.M. on the 8th arrived at Bucharest at 9.30 A.M. on the 9th. This describes the railway communications.

I have confined myself to the northern side of the Danube, the difficulties increased in an increasing ratio as each cart or sleigh drew its load further into Bulgaria.

Communications across the Danube at Petroshani and Nicopolis were also by boat at this time.

## LECTURE.

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Friday, March 29th, 1878.

LIEUT.-GENERAL W. M. SCOTT McMURDO, C.B., in the Chair.

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### ON THE EMPLOYMENT OF THE RESERVE FORCES IN CASE OF AN EXPEDITIONARY FORCE BEING SENT ABROAD.

By Colonel H. C. FLETCHER, C.M.G., Commanding 2nd Battalion  
Scots Guards.

THERE is a well-known proverb, *qui s'excuse s'accuse*, and at the risk of having it applied to myself, I must preface this paper by saying that I can put forward little that is new, or that has not been thoroughly considered by those whose duty it is to make the necessary preparations for war, on paper, if not in a more practical manner. All that relates to the defence of Great Britain, has been dealt with in various books and pamphlets and formularised into plans more or less feasible, and little remains for me except to lay before you a digest of other people's thoughts, and to endeavour to present a picture of the state of affairs that would arise if England were engaged in serious war.

Let us therefore endeavour to realise the condition of the country soon after war had been declared with a powerful European nation, and for the sake of argument and without prejudice let us suppose that nation to be Russia. Two army corps, comprising the whole of the regular forces of England and Ireland, excepting the skeletons of a few battalions, including six battalions of Guards, and a regiment or two of Household Cavalry, and made up of the Army reserve, and a large portion of what is called the Militia reserve, have left for the East. There are 10,000 men on their way from Canada, and the advanced corps of a force of 80,000 native Indian tooops are passing through the Suez Canal. The country is denuded of regular troops, and their ordinary work, as well as the task of providing reinforcements, is falling on the Reserve forces and on those who are left in charge of the various districts into which the country has been divided. Little or no analogy can be deduced from what was done during the Crimean war. At that time we drifted into a state of hostilities after a long peace, with but little or no prepara-



tion, and without recognising the latent power which a country possessing the population and wealth of England, can put forth. We fought our battles with a small body of regular troops, helped indirectly by the Militia, who garrisoned the fortresses in the Mediterranean, maintained a respectable armed force at home, and whose Officers worked nobly and unselfishly in providing recruits to repair the losses of the regular troops. As the war went on we had recourse to shifts and expedients which I scarcely think creditable to a great country. We sent to Germany, Switzerland, and Italy to hire mercenaries, whilst we neglected to utilize the large and I may say warlike population of our own Isles, not apparently imagining that soldiers could be procured by other methods than those which obtained during our wars in Spain and in America. In thus acting we, however, only followed former precedents. Indeed, to quote from "Clode's Military 'Forces of the Crown,'" no Continental war was ever previously carried on with so small a number of foreign troops. The idea seems to have been that armies were to be recruited solely from the lower classes; that soldiers should be purchased in the cheapest market, and—provided they reached to a fixed and certainly not high standard of physical qualities—that it was a matter of indifference whether they were fighting for a cause in which they were interested, or merely for their pay. Happily for us, the brunt of the struggle fell on our own brave national troops, and notwithstanding the many disadvantages under which they laboured owing to the neglect of the Army by the nation during the years that followed the fall of Napoleon, they manfully upheld their ancient renown, and brought us out of difficulties that it would be most unwise to incur again.

The ideas of the scale on which war can be conducted have changed since the Crimean days. Nations have learnt that by proper organization, and by the use of the many mechanical means which this century has produced, armies of a size unknown in former European history can be brought rapidly from distant points to the scenes of operation, and can be maintained with little reference to the seasons of the year, or to the resources of the country which may be the theatre of the campaign. War is no longer the affair of the upper classes as leaders, and of the lower as soldiers—all ranks and all conditions must take part in it, whether forced to do so by the iron rule of conscription, or propelled by the influences that free countries like England and America should know how to exert when a great national struggle stirs to the depths the patriotic feelings of the citizens. If we refuse to imitate the practice of continental nations, we may still take a lesson from the gigantic efforts made by the Northern and Southern States during the Civil War of America, and we may gather from a study of those campaigns, examples, or rather warnings, of the necessity of realizing at the commencement of a struggle the efforts requisite for conducting it to its ultimate end, and the losses in men, money, and honour, that will flow from neglecting to put forth the national energies at the outset of a war.

Before proceeding further, it will be well to come to some understanding as to the land forces on which England would have to rely.



We have at home, according to returns based on the Army estimates,

Standing army .. ..	90,000
Army and militia reserves ..	38,000
Militia .. ..	85,000
Effective volunteers ..	180,000
Second class army reserves ..	23,500
Yeomanry .. ..	10,000
<hr/>	
Total ..	426,500

And we learn from Mr. Gathorne Hardy in his speech on moving the Army estimates that he looks upon 400,000 men as the basis of our military establishment. It will, therefore, be allowable to take these figures as representing approximately the home forces with which we should commence war. In India we have 63,000 European, and 120,000 native troops, besides contingents, which (paid by semi-independent Princes) might be attracted to our service. We have also the resources of our great colonies, who, if England were seriously committed to war, would not be content to be mere lookers-on of the struggle of the parent State. From Canada we might, I believe, reckon on 10,000 infantry, a regiment of cavalry, and two batteries of artillery, and at least a company of engineers, as a first instalment, which her own warlike population, supplemented by the many restless spirits of English birth from the adjoining great Republic, would easily keep up, if they did not increase.

As the actual commencement of hostile operations on land would depend on us, and as even the theatre of the campaign would also be open to our selection, the strength, composition, and time of sending abroad an expeditionary force would in great measure be influenced by England's preparation for war. Efforts are now being made to get ready for the field two army corps of 74,000 Officers and men. To do this, thirty-nine battalions of the Line, and three of the Guards would have to be sent, and these battalions, after being weeded of youths who have not completed eight months' service, would require, to bring them up to war strength, about eighteen thousand five hundred (18,500) men, who would have to be drawn from the Army reserves, the Militia reserves, and from the 35 battalions of Guards and Line who would still remain after the departure of the two corps. These home battalions would consequently be greatly attenuated in numbers, even although they had received into their ranks the younger soldiers of the war battalions. Therefore, to complete them, 23,000 men would be required, whilst, to bring up the 109 Militia battalions to war strength, 50,700 would have to be raised. In all, without counting India and the Colonies, nearly 74,000 infantry recruits and 4,000 cavalry and artillery recruits would have to be found with as little delay as possible. But these numbers do not represent the strain that would on the outbreak of hostilities fall almost immediately on the population. The losses of war would have to be met, and our Indian Army supplied. For the former 75 per cent. of

the number in the field is considered to be a fair annual proportion' therefore to maintain in the field 60,000 men, an annual supply of 45,000 becomes requisite, whilst the average number for India and the Colonies would be 8,000. Considerably more than 100,000 recruits would therefore have to be obtained in the first year, in order to complete and keep up two *corps d'armée*, and to maintain the Militia (which would be the reserve as well as the training school of the troops in the field), and to afford the ordinary drafts to India and the Colonies. We must therefore imagine our quiet and somewhat sleepy brigade-depôts in full working order, recruits constantly pouring in, being provided with arms, clothing, and accoutrements, and then passed on to the affiliated Militia battalions, who would probably occupy the barracks and quarters of the absent troops of the Line. Aldershot, the great training school of the country, would afford permanent accommodation for a large number, whilst during the summer months additional troops would be placed under canvas. Other stations would be selected for camps of instruction, their localities being fixed in great measure with reference to the enemy with whom we might be engaged. If there appeared any possibility of invasion, our Southern and Eastern districts would necessarily monopolize the larger portion of our home Army, and the conveniences of localities for training local troops would have to give way to the general scheme of defence.

The memorandum on Mobilization drawn up for the Government, divides the home Army into six corps for England, one for Ireland, and one for Scotland; four of these corps being allotted to the southern counties of England. These corps comprise regular troops, Militia, Volunteers, and Pensioners, who would be stationed in permanent camps, in our fortresses, and in the case of the coast volunteers as near as possible to the localities to which they belong; whilst a large entrenched camp near London would probably be the head training station of the Metropolitan forces.<sup>1</sup> If the war were between ourselves and an enemy not possessed of naval power, the necessities of protection from invasion might give way to the advantages of localizing our forces. The loss of labour consequent on the withdrawal of so many men from their ordinary pursuits would entail much inconvenience; and if military training could be so arranged as to permit of a large proportion of the force being on leave during the seasons of the year when agricultural labour is most required, considerable saving in the waste of the wealth of the country might be effected. In the same way with the Volunteers. The embodiment of portions of regiments would be necessary, not only that garrison duties should be properly carried on, but for purposes of discipline, as men must be brought together somewhat permanently under their Officers and non-commissioned officers in order to acquire the cohesion requisite for a military force.

Arrangements might doubtless be made for the garrison duties to be

<sup>1</sup> The mobilization scheme provides for the full employment of the Volunteer force. In addition to the garrisons which would have to be furnished for the fortified places, the coast volunteers organized into brigades would oppose the enemy on first landing, falling back on the positions selected for defence.

performed week about by certain regiments or companies of Volunteers, as it is most important that the young troops who are being trained as reinforcements for the Army in the field should not waste their time and injure their health by performing the routine of what soldiers call *sentry go*. They require their days for military exercises, for drill, for shooting, for outpost duties, and for instruction in the various requirements of a soldier on service; and, consequently, they must be relieved from garrison duty, and not be expected to be trained, like the drafts for the Guards' regiments, during the Crimean War, in the midst of a great city and with *three nights in bed*. The volunteers of our cities and of our garrison towns might be most useful in affording this relief to the young soldiers of the regular Army and of the Militia, in addition to the drill and exercises which those not on duty might undertake daily by a proper distribution of time. For it must be remembered that a serious war will change ideas in regard to relaxation, and mere amusement will have to give way to the relief which an alteration in work affords. Many of our clerks, shopkeepers, and citizens could afford an hour daily after the termination of their ordinary work, if the places of training were sufficiently near; whilst a well organized system of Sunday parades would not only give fifty-two additional drills in the year, but would often tend to the better keeping of the day.

Thus, whilst our garrisons in the Mediterranean are occupied by Militia to be fed from their dépôts; whilst our fortified places at home have also received Militia and local Volunteers in place of regular troops; whilst large camps have been established at convenient places for the receipt of recruits from the brigade dépôts, and for the better training of temporarily embodied regiments of Volunteers, every means should be taken to find places and to arrange time so that the Volunteers of the great cities should have the advantage of drill *pari passu* with their regular work. It will be in the recollection of many who are still living, that the fear of invasion at the commencement of the present century gave rise to a similar state of affairs. Then the great mercantile establishments raised, trained, and officered companies of Volunteers. Men did their work in life like the Jews described in the Book of Judges, with their weapons ready at hand. Besides Militia which were permanently embodied, and which possessed the qualities of regular troops, there were in England alone, in 1805, 350,000 Volunteers, comprising cavalry, artillery, and infantry. These were regularly reported on by the Generals of the districts, and on the whole their reports were very favourable—"fit to take their place with troops of the line" being the usual observation in the columns of remarks.

It will not be out of place if we glance at the work performed by what are now termed the Reserve forces, during the close of the last and the commencement of the present century. To quote from Raikes's "Reserve Forces," out of 80,626 militiamen, in the year 1798, 15,712 volunteered to serve under Sir Ralph Abercrombie, and shortly afterwards 10,414 joined the regular Army. In 1808, 30,883 men were obtained for the Army from the Militia, whilst in 1813, the Officers and men of the Militia were allowed to volunteer into the Army or to serve as Militia with the Army abroad, the battalions and regiments of



Militia being under their own field officers. In 1800, as much as 60*l.* is said to have been paid at Plymouth for a substitute, whilst one man went on condition of receiving four shillings a day, and another sold himself for seven and threepence a pound. A general Militia Act was passed in 1802, by which men between the ages of 18 and 45 were to be raised by ballot, and to pay a fine of 10*l.* to be exempt for five years. In 1808, a local militia was raised, and 214,000 men were obtained by ballot, no substitutes being allowed. During the Peninsular War, besides furnishing Officers and men to the Army, the Militia served *quâ* militia in Portugal, whilst they sent large quotas to the army that fought at Waterloo. At the time of the Crimean War, the Militia furnished from 25,000 to 30,000 men for the line, whilst 50 regiments, representing nearly 41,000 men, volunteered for foreign service, and of these ten regiments were selected to serve at Mediterranean stations; during the Indian Mutiny also, 18 regiments offered themselves for service abroad.

In addition to the Militia, large numbers of volunteers were raised under the Defence Act of 1802, which was subsequently amended by the Levy en Masse Act, when 420,000 men volunteered partly to escape the ballot for the Militia. In 1804 and in the four subsequent years, the number of volunteers in Great Britain averaged about 350,000, Ireland furnishing 70,000. A portion of this force received pay up to 1806, after which date, arms only were issued, as it was found that men who ought to have been serving in the regular Army or the Militia, had enrolled themselves in the Volunteers. It is difficult to arrive at the exact numbers, as they of course varied from year to year. To quote from statistics compiled by General T. B. Collinson, from records in the Quartermaster-General's office, and brought under the notice of this Institution in his admirable paper entitled "Another Warning Voice from 1805," it appears that in November, 1803, there were 327,286 volunteers under arms, whilst two years later (and the numbers were probably nearly the same as those in 1803) there was a force of 9,622 regular artillery, 12,984 cavalry, 47,116 infantry, 56,316 militia, making a total of 126,028 regulars and militia, or a grand total of upwards of 450,000 men under arms in Great Britain alone, of which the population was less than half what it is at the present time. I mention these numbers as giving an idea of what this country can do under the pressure of a serious crisis and of a great war, although I cannot help agreeing with Mr. Burke, who, denouncing this timid policy, says, "Who would have credited that 200,000 men were kept in England and 80,000 in Ireland for the mere purpose of an inert and passive defence, and that by its very constitution the greater part of this force was disabled from defending us against the enemy by one preventive stroke of active hostility?"

It is partly with the view of directing attention, not only to the effort this country is capable of, but also to the blot in a system which keeps so large a portion of the Army from fighting beyond the shores of Great Britain, that I have brought the subject of the employment of the Reserve forces under your notice.



There is no more false economy than that of stinting military operations at the commencement of war, or of failing thoroughly to recognise the gravity of the occasion and the necessity of sacrificing preconceived notions and individual interests to a mighty and sustained effort.

In well ordered and systematically governed countries it is always a difficult matter to induce departments to take broad and unaccustomed views of subjects, the details of which engross their daily attention. The very excellence of the organization of Government Departments, and the very zeal of the employés, may even detract from their ability to meet an unexpected strain. There is a tendency to lose sight of great objects and to work for narrow aims instead of for the general good. The heads of departments are probably free from prejudices, and are anxious to push the coach on; but those who grease the wheels do not work heartily with those who repair the harness, whilst the road makers, intent on the excellence of their roads, cannot be induced to prepare rough-and-ready tracks for temporary and exceptional use. In England there are immense resources for war, but these resources cannot be utilized without changes in the organization of our military establishments, which are doubtless suited for dealing with the frequent small wars in which England is engaged, but which require elasticity to meet a great crisis. Napoleon's system, which in the height of his career he certainly pushed too far, of refusing to recognise any difficulties, and requiring his subordinates to carry out his plans without putting forward objections, has many merits, and might be copied with advantage in the administration of our military affairs. Boldness is essential not only in the conduct of armies in the field, but in the adoption of plans involving change, and a departure from the accustomed grooves.

I hope, however, that if war break out, we should fully realize our position and that the end of the first month would see England converted into a great camp, recruits pouring into the dépôts, camps of instruction in full swing, and the volunteer regiments, with higher standards of efficiency than at present, taking their turn in the regular military duties of the towns and garrisons, and furnishing large quotas in rotation for periodical training at the camps. Many of those who had left their ranks would rejoin the several corps to which they previously belonged, and active and energetic retired Officers of the Army would offer their services as instructors of the additional battalions and companies that would speedily be raised. The Yeomanry—converted in most instances into mounted riflemen—would give an outlet to the military instinct of the farmers, and afford no mean reserve to the cavalry, whilst it would be found almost impossible to check the formation of field batteries, which I feel confident might be sufficiently trained to act with infantry in the event of an invasion. The strain on society would at first be very great, but gradually we should accommodate ourselves to the new condition of affairs, and would be able to show foreign Governments an example of the latent energy possessed by a free country. The principal difficulty would be that of discovering the best method of

raising the number of men to fill the ranks of the regiments of the Line, and of the embodied Militia. If the country could be brought to acknowledge the necessity of a modified conscription, the task of recruiting would be greatly diminished. Once get the men by conscription into the Militia, and the Line could easily be fed from this source, whilst, as has been pointed out by Lord Elcho and others, the standard of efficiency of the Volunteers, supposing them to be exempt from the ballot, might be considerably raised. Merely by money inducements, whether given in the shape of pay, pension, or bounty, it would be a hard matter to raise the requisite numbers. The United States nearly succeeded in doing so, but towards the close of the war a man was worth £200; and the demoralization and abuses consequent on the offer of high bounties are so lamentable that almost any plan would be preferable to such a method of procuring recruits. It may be impossible to face this difficulty until the nation and the Government are brought face to face with it, but no pains should be spared in the preparation of some scheme that could readily and quickly be put into operation. If high bounties be once given, or if they be even expected, it will be a hard matter to withdraw this bribe to the class who would benefit by them, and a check to recruiting would be occasioned at the very time men were required. Far better at the outset of hostilities to place the whole matter fairly before the country, and to put in force the law now in abeyance of ballot for the Militia.

To return to the subject of the Reserve forces: it will doubtless have been observed, that throughout this paper the despatch of an expeditionary force of only two army corps has been contemplated, whereas England, with her population and wealth, ought to be able to keep in the field more than double that number, if any analogy is to be furnished from the efforts made by other nations. I believe it would be impossible as war went on, and as men warmed to the work, to check the enthusiasm of the Reserve forces. They would not be content to see their comrades of the line engaged in the field, and they themselves kept in garrison and in camp. During the Crimean War, the regiments of militia at Corfu and Malta would have willingly volunteered to join the army before Sebastopol. Much more now, when military knowledge and military feeling have been spread throughout the country, and when all classes, even in peace-time, readily bear a portion of the burden which soldiering entails. It may be said that these regiments could send recruits to the Line; doubtless they would do so; but if their services were accepted as regiments, far larger numbers would volunteer; and if universal conscription is to be avoided, every channel must be thrown open by which troops are to be procured. Doubtless there are difficulties to be overcome and prejudices to be rooted up; but it would be a bitter satire on free institutions if it were said that England would not bear the burden of conscription, or show sufficient intelligence to adapt existing regulations to meet an abnormal condition of affairs. In the same way, the volunteers who form the outlet for the military energies of our middle classes, ought to have opportunities given them for service before the enemy. Their motto is, "Defence, not Defiance;" but Heaven forbid that England

should ever wage wars of defiance; she merely fights to defend her possessions, although to do so she must fight beyond the seas.

It is said that several regiments have already placed their services at the disposal of the Secretary of State for War, and it would probably be possible to raise from the effective volunteers a considerable force, and one which any Officer would be proud to command. A difficulty might arise in maintaining it without trenching on the recruiting grounds of the Army and the Militia; but if there were conscription for the latter, with inducements to enter the regular Army, and an exemption only in favour of efficient volunteers, the latter might maintain as well as furnish a representative force in the field.

As the war went on, much that appears now to be complicated would disappear, and a system once organized would either simplify itself or develop its impracticability. In the meantime, a force formed of the present efficient volunteers, and well officered, would not only add considerably to the strength of our army, but would be of political importance as evincing the earnestness of the people, and the readiness of classes not usually found in the ranks of the English Army, to take their part in the dangers of war.

A clear recognition of the distinct duties of the Reserve forces might prevent mistaken ideas, and lead to a simplification of plan. Their first duty, as has been pointed out, is to provide for the reinforcement of the troops in the field. From this, the volunteers, as volunteers, will be exempt, unless they were prepared to despatch a representative force, and act with the army abroad. The second duty of the reserve forces, is to be in readiness to take their place in the field in the event of additional *corps d'armée* being required, and then dépôts must be provided for them, as well as for the regular Army. The system would remain the same, viz., recruits for the forces in the field joining at the several dépôts, and being transferred from these dépôts to the camps of instruction, previous to their embarking for service abroad; the work of garrisoning England would then fall exclusively on the troops retained permanently for home defence, and provided from the classes who could not devote their whole time to military work.

Thus the advice given by Mr. Pitt in his speech in Parliament on the Volunteer Act of 1803 would be followed:—"I was formerly," said Mr. Pitt, "and still am, of opinion that to a regular army alone, however superior, however excellent, even aided by the militia, we ought not solely to trust, but that in a moment so eventful, in a contest so singular in its character, and which perhaps may be tedious in its duration, we ought to superadd to the regular army some permanent system of national defence, either to a certain degree compulsory, or formed upon the voluntary zeal and patriotism of the country itself. This ought to be resorted to as the grand source of domestic security. The army must be the rallying point; the army must furnish example, must afford instruction, must give the principles on which the national system of defence must be formed, and by which the volunteer forces of the country, though, in a military view, inferior to the regular army, would, fighting on their own soil, for everything dear to individuals and important to the State, be invincible."



There is still another duty which, though perhaps not coming directly within the scope of this paper, has so near a relation to the efficiency of an army raised from the body of the population, that I may be excused from alluding to it. If our Army and Militia reservemen (many of them being married) were called into the ranks; if the militia were to furnish large drafts to fill up the gaps of war; and if the volunteers contribute their quota, there must, owing to the prevalence of early marriages, be a very considerable number of women and children deprived of their natural supporters, and reduced to great straits for a livelihood. It is a grievous thing for a fighting man to think that his wife and little ones are in penury and want. It would militate greatly against voluntary enlistment if men felt that their absence would entail privations on their families, whilst an almost equal evil would be occasioned if indiscriminate charity were lavished on those who were left at home. There is, therefore, a vast field for organization and for systematic preparation, if the best method of assisting the wives and families of the men who would fight the nation's battles is to be arranged, and if the opposite evils of neglect and of unwise benevolence are to be avoided. Doubtless, much of the work now performed by men might, without undue tax on their strength, fall on the weaker sex, and it would be the duty of employers of labour to endeavour to discover how this arrangement could best be effected; but still there would be plenty of scope for charity, and a wide field in which those who do not actually fight the battles of the country may still labour to contribute to the national weal.<sup>1</sup>

In more than one way must the patriotism of the employers of labour be appealed to. If conscription is to be avoided, indirect as well as direct encouragement will have to be given to recruiting for the Army (and in this word I include the Reserve force). Nor, as at present, must some of our principal railways refuse to take reserve men, for fear lest they should be called on in case of any national emergency. The education and training of soldiers ought to be a passport to many of the situations where habits of order and discipline are essential. The railways, the police, the county constabularies, and the warderships of prisons would furnish employment for large number of men who have completed their three or six years in the ranks; and in the event of serious war, their places could, after a little while, in many instances be filled by those whom wounds and sickness might have incapacitated for active field service, and who would yet be fitted for less arduous work. Some sacrifices would doubtless have to be made, the luxury of perfectly performed work, and of a superabundance of labour might have to be foregone, and the public would have to bear with deficiencies which a great national war necessarily entails. To any-

<sup>1</sup> An announcement has just been made of the intention of the Government to call out the Army and Militia Reserves. The difficulty, therefore, of dealing with the wives and families of those who have to join the ranks should at once be met. The evils of affording them parish relief are so obvious that they do not require enumerating, but there are other ways in which assistance can be given, and policy, equally with justice, points to the necessity of at once meeting the difficulty, and of alleviating the distress which the withdrawal from their families of so many husbands and parents must necessarily cause.



one who travelled through the Confederate States during the Civil War, numerous instances will occur of the absence of the usual supply of labour, and of the inconveniences ensuing from such a condition of affairs, which were cheerfully borne by a people earnest in the cause to which they were committed.

I have endeavoured in this short paper not so much to lay down any definite duties for the Reserve forces, as to point out how much will be expected from them if England were to be drawn into war with a great Power. A prevalent idea among many persons appears to be, that,—secure in their island,—they will be able to look on at a war in which the regular army, assisted perhaps by a few of the more eager of the regiments of the Reserve will take part, and that, beyond paying an increased income-tax, they will have little personally to do with it or to suffer from it. To the majority of Englishmen this was the light in which the Crimean War presented itself. There was little outwardly to mark that England was engaged in an important struggle: the sentries on the palaces and public buildings were perhaps rather smaller and younger, and if anyone took the trouble of going to Aldershot he would have seen a large force of embodied militia, and at Shorncliffe some German mercenaries, but the ordinary life of the English people was not disturbed; everything went on as usual, and few thought of putting themselves even to inconvenience to assist in the prosecution of a war, waged far from our own shores, and not directly affecting every-day routine. But if the cloud which is now showing itself over the European horizon bursts in storm, the work that Englishmen will have to do will tax all their energies. It is a good sign that both in the Regulars, the Militia, and the Volunteers, recruiting improves as the reality of active service presents itself. It is encouraging to see the increased efforts which are being made by the volunteer regiments to raise their standard of efficiency, not only in what may gratify the eye, but in real essentials which even the regular troops are only beginning to recognise. The provision of regimental transport, and the best method of using it, together with the formation of ambulance corps, are attracting the attention of many of our volunteer regiments, whilst the fact alluded to by Mr. Hardy of the number of annual encampments is a proof of the zeal with which all that tends to the best method of military training is taken up and practised. So far so good, but more will probably be required. The necessity for conscription may have to be faced, and the country may have to show that the sneer against our young men from the city and from Manchester imputed to Prince Bismarck has no foundation, but that true civilization does not lead to effeminacy or to an evasion of dangerous duties. The thought of fighting our battles by means of extraneous aid, except merely as supplementary to the National forces, ought to be put aside. How can we ask Canada for help, if we do not avail ourselves of our own Reserve forces? Is it consistent with our dignity, or even with the safety of our Indian Empire to employ Asiatics, when Anglo-Saxons sit at home at ease reading the highly spiced narratives of newspaper war correspondents? We must fight our own battles, or fall as every empire has fallen that evades danger in the belief that gold can be a substitute for iron.

Lord Bacon, in his essay on the True Greatness of Kingdoms and States, gives the following counsel: "Walled towns, stored arsenals, and armories, goodly races of horse chariots of war, elephants, ordnance, artillery and the like—all this is like a sheep in a lion's skin, except the breed and disposition of the people be stout and warlike. Nay, number itself in armies importeth not much where the people are of weak courage." Therefore, he continues, "let any Prince or State think soberly of his forces, except the militia of natives be of good and valiant soldiers; and let Princes on their side, that have subjects of martial dispositions, know their own strength, unless they have been otherwise wanting in themselves. As for mercenary forces, all examples show that, whatsoever Estate or Prince doth rest upon them, he may spread his feathers for a time, but he will mew them soon after."

I should like to conclude this paper with one practical suggestion: If a volunteer brigade could be raised for service in the field, it would be well for those who would comprise it to place their services at the disposal of the Government for the forthcoming summer drills. It would then be seen of what good stuff such a body of troops was composed, whilst a fortnight's peace campaigning, and the intercourse with the staff under whom they would act, and with the troops alongside of whom they would serve and fight, would work wonders in welding the heterogeneous elements of which such a brigade would necessarily be composed, into a concrete and solid mass fit for any duty to which it might be put.

In foreign countries the impulse of action has to come from above—in England and America it is the people who push on the Government; and therefore at the present crisis, when war and peace are trembling in the balance, there is an opportunity for our Reserve forces, and for those who command them, to systematize schemes of improvement in, and to organize plans for, the employment of the vast latent power for war which England possesses, and which she ought to be able thoroughly to utilize.

Colonel Lord WAVENEX, F.R.S.: I rise to address this meeting at this early stage of the discussion on a special ground. It was my fortune to hear yesterday declared to the assembled Legislature of England the necessity of placing the Reserve Forces under arms, an event which probably will be one of the most remarkable of the last half of this century; and I find to day by an extraordinary coincidence to find that my gallant friend the lecturer has given us an insight into what the use of these Reserve Forces may be. In both cases there is an identity that is gratifying to every one who respects the self-restraint of the English people. The announcement in the Legislature was received in respectful silence, but certainly with reference to the enormous results that might be the consequence; and when we had recalled to us, and as I will in a few words show, for an excellent purpose, what has been of old by the Reserve Force, that announcement was also received with the silence of men who are not carried away by sudden floods of impulse or sentiment even on great occasions. I said it was of importance, because you may depend upon it at this moment every eye in Europe is fixed on the proceedings of public meetings in England, and this meeting in which the representatives of the two Services are gathered together, will have its comment in every newspaper on the Continent. I speak with certainty, and for this reason, that I have observed in the continental press for some time past a desire to depreciate the motive power, in military matters, of England; a misconception, but one which generally prevails, and therefore in

proportion to the business-like, soldierlike, calm way in which the question has been laid before us, and in which it will be treated, will be the new light that will be borne in upon those who are disposed to undervalue the military power of this country. And I say it is of importance also because you must bring all things to a mathematical foundation in military matters. Genius in a chief, zeal in an Officer, obedience in a soldier we may expect, but after all, the innate forces of the nation are those which are to be consulted. To illustrate this I am bold to say that, for Imperial purposes, the military forces of this country put in action in the true spirit and genius of British war makes us as formidable a military power as any in the world. What is the genius of British war? Expeditions supported by fleets, maintaining a communication with the home country, and supported again by Reserves. And there is a double preparation of Reserve which I see has been referred to in this lecture, that is to say, the Reserve of supply for the army in the field, or the army of operation, and the reserve of resistance, which is left at home for home purposes. With regard to the Reserve I have a very strong and decided opinion as to the means by which the general subject may best be treated. I believe it is better on all occasions to avoid a confusion of supply, so to speak. For instance, drawing men from one regiment into another, as has been recently done to the extent of 4,000 men in order to make up the first army corps. It would, I say, be better if each could be prepared in its own way and in its own line, for its particular service. This brings me to this point, that the principle of conscription in some shape or another is one which we shall be compelled to adopt, and in adopting it let us make it consentaneous with our spirit of aggregation in individuality—what is called so happily the *esprit de corps*. Let the Army have its own duties. I know that during the Indian Mutiny, militia regiments volunteered for foreign service, by which I understand for India.

To show the effect of the organization of the Militia Service so that it might be ready to volunteer for foreign service, let me state this, that during the Indian Mutiny my old soldiers came to me and said, "Sir, can't you take us against these 'sepoys'?" I said "No, I can't." Then they said, "What are we to do?" I said, "Why, there is the recruiting sergeant, you can go and join the regular Army," "No," they said, "we will go with our Officers and our old comrades, but we will not go in the regular Army." I was very glad to hear what was said about Volunteers. The Volunteers are men of whom none can speak too highly for their zeal, their spirit, their intelligence, or for the way in which they take to hard work. I have not been a colonel of Volunteer Artillery, but I know the hard life that they have led for the short period that they were under canvas. I remember on two special occasions the Essex brigade had an excessively wearisome and unhealthy duty; they marched into camp for their four days' drill. The weather was wet, they pitched wet, they remained wet, the weather was bad the whole time, and of course they were not provided with the same means of resisting the weather as regular troops would have been. However, in spite of all these drawbacks and difficulties, the men did their work thoroughly well. Still a trial of that kind is too great a strain for men who are not accustomed to rough service in the field, and therefore I lay great stress upon their having the opportunity of acclimatising themselves to the service of war. I was very much struck with the careful foresight shown with regard to the provision for women and children. Nobody knows so well as the commanding Officers of Militia, the numbers of women and children belonging to the Militia Service. I was perfectly startled the first time I mustered all the women and children in my brigade when we were about to leave head-quarters for district garrison during the Crimean War. I endeavoured to persuade as many as I could to remain at home with their families, knowing what, under the circumstances, garrison life must be for them. The difficulty has to be met as best it may, and it should be met both in regard to militia regiments moved from point to point, and in regard to the regular service in the same way. At any rate I can answer for this, that when the time comes, there will be one voice at least which will place before the Government the suggestions that have been made by our lecturer.

Major WETHERED, Paymaster, R.A.: I must apologise for trespassing upon the meeting as a non-combatant, but in times like these every Englishman is justified in doing what he can to forward suggestions. I quite agree with what the lecturer said,



but I should like to understand more clearly our plan of defence in the event of threatened invasion. It appears to be generally admitted that there are vulnerable points on our shores upon which an enemy could throw a large force if he had freedom in the Channel from the attack of our fleet. The idea, if I am rightly informed, is not so much to defend those vulnerable points as to collect our forces within certain lines converging on these points, where they might meet an enemy that had effected a landing. This is a vital and important matter, and I consider that all our energy should be taxed to prevent the possibility of hostile forces disembarking on our shores. If there are vulnerable points upon our coast, surely we might have some means not of merely concentrating a large force of Volunteers or Reserves, because the concentration of troops takes a considerable time. We see the difficulty that there is on Easter Monday in conveying a few thousand Volunteers to a particular point on the coast. There is also this danger to be considered, the enemy might make a feint to land at one particular spot, and as we were collecting our forces by the lines of rail converging at that point, the enemy might run for another part of our coast to which our assembled forces could not be transferred by railway without passing through the small and dangerous artery of the Metropolis; but surely we might take greater advantage of the facilities which our insular position and railway system might afford for concentrating on those given points an overwhelming force of artillery. I won't say very heavy guns, but large long-range guns capable of being fought on the railway metals, which might be brought to bear upon any disembarking troops so as to prevent the near approach of the enemy's ships, and check the landing of the force while our Volunteers and Reserves were concentrating. There are many other points which may be considered in connection with this subject. If possible, in case of threatened invasion, I should like to see our fleet blockading all the enemy's ports, and under certain combinations, our whole telegraph system would be interrupted, and it is a matter worth considering how we are best to keep up communication with our fleet in case of war. At present I know of no provision, and I should like one simple experiment to be tried. Our ships which are at a distance would have no means of communicating with our shores except by sending fast steamers between our coast and the fleet; but I would suggest whether it would not be practicable to have the means of sending out from certain points of our coast, steamers fitted with telegraphic apparatus which could run out their telegraph wires and anchor some thirty or forty miles or upwards from the coast, so that when our ships wished to communicate with home, all they would have to do would be for one of their fast cruisers to run for one of these floating telegraph vessels, which would place them in instant communication with the shore and give rapid information as to what was going on on the enemy's coast. That would save our cruisers having constantly to run into port in order to convey information and receive instructions. As I observe that gentlemen of the press are present, I would try to enlist them as Reserve men: I mean in this way. No doubt it is very interesting to Englishmen to know exactly the details of everything that is going on, and it is very desirable that the British public should be well informed as to all those details; but I think we have arrived at a crisis in our country's history when it would be well if Englishmen generally would consider rather our national interests than their own natural curiosity. It is time for the press to maintain a cautious reserve, because what is communicated to our countrymen is communicated very rapidly, perhaps, to that very country with which in a very short time we may find ourselves at war. Therefore, the information given to our enemies, as well as our friends, should be limited. I think also that the time has arrived when our arsenals and dockyards should be closed more than they are at present. We do not know who the persons are who go into them to inspect them, therefore it is desirable that we should be cautious and use some reservation with regard to permitting foreigners to visit them. As war seems to be approaching, that we should look among our employes and see that we have no traitors among us who might be the means of communicating information to the enemy.

Lieutenant-Colonel EVELYN, 3rd Royal Surrey Militia: I think it is very useful, in discussing matters of this kind, not to forget the distinction between Auxiliary Forces and Reserve Forces. The Reserve Forces are the First and Second Army Reserve and the Militia Reserve, but not the Militia.



The CHAIRMAN : Colonel Fletcher explained that in his paper.

Colonel EVELYN : I think the whole of the Auxiliary Forces should certainly be put in proper order at this crisis. We are not in danger, as the gallant gentleman who last spoke seems to imagine, of invasion. I doubt if the Russians have any idea of invading us, but they will prove a stout enemy if we attack them, and I am afraid some changes we have lately made, certainly in the portion of the Auxiliary Forces to which I belong, the Militia, have not been conducive to the efficiency of the force. Regiments have been, I fear, seriously injured by the reduction of staff, by the deprivation of quarters, and by being concentrated in brigade depôts, instead of being allowed to remain at outposts. One serious objection is the difficulty there would be if the regiments have to be embodied in winter, in quartering them on a town. It is difficult enough to billet one militia battalion in a small town, but it is extremely difficult to billet two, and if the Militia are wanted in the winter, as was the case in 1854 and 1855, it will be necessary to billet them, and it is impossible to billet them when concentrated two or three battalions together in one small place, because it happens to be the head-quarters of the brigade depôt. Various Acts under which militiamen have served have generally been misunderstood. There seems to be an impression, rather general, that an Act of Parliament can impose any duties on the militiamen, whether they have been undertaken by his engagement or not. For instance, it was said the other day that an Act of Parliament might be passed immediately, making the Militia available for foreign service; but it seems to be forgotten that no Act of Parliament can, or at least ought not to, affect obligations already taken. An Act of Parliament, to make the Militia available for foreign service during war, ought to be passed, but still it would not affect men already enlisted, at least, if it did, they would no longer be volunteers—they would be pressed men. It was tried in 1855; the Militia were then serving under an Act which only bound them to be embodied in case of actual danger of invasion. They were wanted to replace the troops that had gone to the Crimea, and an Act was passed empowering the Government to embody them; they were embodied, and all over England there was much discontent in the Militia, and Government had to reconsider their measures. I hope that no such mistake may be made now. If the Militia are wanted for foreign service, there will be plenty of regiments ready to volunteer; but no service must be forced on the men, or there will be great discontentment and difficulty. I hope it will be remembered that, if the Militia are to take the place of the line, and are to be a skeleton force in time of peace, always to be depended on to march almost at a day's notice, that the staff of those regiments must be kept complete. There must be no such thing as the adjutancy being taken in turns by the Captain of a regular regiment—that there should be no Militia Adjutant, but an Officer of a regular regiment acting as Adjutant. The choice of an Adjutant for a Militia regiment should not be restricted to the ten Captains of the linked line battalion, of whom the two or three seniors are too near their promotion to hold a five years' appointment. The best of the other Captains do not wish to leave their own companies, and probably the only one who can be induced to accept a militia adjutancy is one who wants to marry, or avoid foreign service, or for some similar reason. That is an arrangement that does not work at all. There are some other things that were to be carried out as proposed by the Militia Committee, such as these; that a militia regiment should even be deprived of its sergeant-major, of its quartermaster sergeant, of its orderly-room clerk, of its paymaster's clerk, in fact, of every single thing that makes a battalion a battalion. Each regiment of Militia was to be made a mere unorganized band of recruits, and to be teased into joining the regular Army as quickly as possible. That would be very much like killing the goose that has the golden eggs. If you want an unfailing stream of recruits from the Militia, you must keep up the militia regiments, and not destroy them, and the staff should be always complete, and lodged in good barracks, under the constant supervision of the Adjutant. Under present circumstances, no better plan could be adopted than that of giving up some of the numerous brigade depôt establishments to the militia battalions.

The Volunteers are a most admirable force, and, for my own part, I have spared myself neither trouble or expense in trying to promote their efficiency. Still, we must remember that in the time of the Peninsular war the Volunteers

fell a great deal into disuse after the establishment of the local militia—a force of which one never hears now, and a force which probably many gentlemen in the room never heard of. It was a force organized in the different parishes and drilled on the village greens, and formed a few times in the course of the year into a battalion. It was found, in many respects, a more convenient force than the Volunteers, though the Volunteers had their place and were most admirable in many respects. But what on earth can induce those young gentlemen in the Volunteers to wish, under present circumstances, to serve abroad as private soldiers I cannot quite understand! However, if they like it well and good, but I am afraid, if they have to work with the pay and allowances of private soldiers, and no others, they would not like it very much. If they expect double and treble pay and pensions when they got home, &c., they will be very expensive, and perhaps hardly worth their money. There is one thing I think would add enormously to the efficiency of the Militia. The system of deferred pay has done a great deal of good in the Army, though some of the provisions under which it has been introduced are not, in my opinion, very judicious. I have some right to speak on the subject of deferred pay, for I believe, if it had not been for a letter of mine that appeared in the *Times*, in October, 1873, the term “deferred pay” would not have been applied to this day, with reference to the pay of the soldier, and I was somewhat amused, a year or two after my letter appeared in the *Times*, to see a long discussion, whether Captain Trench or Archdeacon Wright, or somebody else, was the first to make the suggestion. However, I held my peace. I think a modification of deferred pay might be introduced into the Militia, and would stop desertion to a very great extent, as the men get no pay, except when up for training, it would necessarily be a deferred bounty. I quite agree that, in time of war, a system of ballot for the Militia should be re-introduced. But if it is, I do think a man who is balloted for and serves in the Militia five or six years, ought not to be turned adrift, without a farthing in his pocket, at the end of that time; and if the country gave every man who did good service during his period in the Militia, a 5*l.* note, it would not be a bit too much for him to go back to his friends with, and it would make the militia service far more popular than it is, and would prevent the great militia riots which occurred in the late war in consequence of the Ballot Act being put in force. That Ballot Act was carried out with great difficulty, and was attended by several great riots. It was found very difficult to carry out a measure of that sort in England, and doubtless nowadays the difficulty would be increased.

Major WETHERED: I should just like to explain that in what I stated I did not for a moment intend to express the belief that Russia would invade England.

General Sir WILLIAM CODRINGTON: I do not know whether the lecturer referred to the conscription as a necessary part of the Reserve, or any part of the system of England, but Lord Waveney did so refer to it, and possibly it might go forward that it was the feeling of a great number of Officers, that it is necessary to have conscription in England. Now, as everyone is entitled to his opinion, I must own my opinion is decidedly against it, except in case of necessity balloting for Militia for home defence. Conscription for general Army service is contrary to the feeling of England. Not only is it contrary to the feeling of England as a matter of oppression, but it is an extreme oppression in France, in Prussia, and in Russia, where there can be no question about it, and as such, it is contrary to the usual habits and spirit of liberty and feeling in England. On the other hand, I do not believe that there is any more expensive system than this one of conscription. Cheap to the Government, but not nominally cheap for general national interests, or for the lives of the men exposed to it; because I believe there is very little doubt that the hospital and other arrangements in a conscription-country in war have not the same attention paid to them as in England, where the Army is a volunteer army. One main point, however, is that it is a very expensive system nationally. You take away from all classes of society the best members for national improvement, its able-bodied and those of full age; and you force them into the Service not only in war but in peace. They are taken and not able to carry on their own business; or to marry for so many years; I think it is ten, and this in the very prime of a man's life. Therefore I hope it will not be considered as a necessity for England that conscription should take place for the Army.

Lord WAVENEY : I hope I guarded myself in what I said ; in fact, I am quite sure I did so guard myself in the first part of my observations. It is this : to the *principle* of conscription we must come ; I believe we must come to the principle of general obligation for service, and I think I guarded myself by saying, whether it be by the old form of the ballot, which in its original form takes every man, or by some other manifestation of the principle that no man is to be held exempt from the ballot for home defence, I should wish it to be felt that there is always an obligation to serve for home defence.

Colonel ALCOCK : I am perfectly convinced that the great strength and power of this country arises from the system of voluntary service, and that the actual weakness of foreign countries, although it may appear to be otherwise, arises from obligatory services, and the reason is very obvious. It is this, that the tyranny of the obligatory service is so great that the time will ultimately arrive when the people will resist it, and it must be felt at this moment in Russia ; in fact, we are told by the public prints, that in that country unfortunate men are seized in their homes and marched off immediately to the war without having an opportunity of taking leave of their friends. The conclusion I come to with reference to the discontent so caused, is one in which I am supported by, I believe I may say, a great philosopher ; for it was the opinion of Auguste Comte many years ago, when he said that the people would ultimately rebel against the tyranny of compulsory service. There is in continental countries another source of weakness connected with this which does not affect us, and the freedom from which among ourselves, must add enormously to the stability and power of England, and that is the effect of the secret societies. It is perfectly well known that there is a mine of socialistic dynamite under many kingdoms, and especially under Russia, and that mine is ready at any moment to explode. I will say no more upon this subject, but still I adhere to my opinion.<sup>1</sup>

Lieutenant G. H. HOSTE, Civil Service Rifles : A gallant Officer, who spoke on the opposite side of the theatre (Colonel Evelyn) drew attention to that part of the lecture which dealt with the question of the employment of Volunteers on foreign service. As is probably known to most of this assembly, this question has been recently much ventilated, and the most opposite views are expressed about it. For my own part, speaking not for a class but as an individual Volunteer, I must say that I cordially agree with the arguments advanced and the conclusions arrived at by Colonel Fletcher. It was said by Colonel Evelyn that Volunteers serving abroad in time of war would not care for the life. Now, Sir, I do not suppose that anybody goes to war with the idea of enjoying himself, but rather with that of doing his duty ; and I am convinced that, in the discharge even of the arduous duties of active service, Volunteers would not shrink from encountering the hardships. Equally do I hope that there are many who, in such an emergency as has been described, would be willing to sit very loosely to their civil professions, or even to give up those professions and their prospects altogether, and who would gladly enrol themselves in a special brigade or division for service abroad. I do think that the Volunteer Force ought to consider itself greatly indebted to Colonel Fletcher for having drawn out a definite scheme by which the opportunity of serving abroad is promised to it, and I trust that, if the need arises, that opportunity will be accorded.

Lieut.-Colonel BUSHBY, Rifle Volunteers : The gentleman who has just spoken has partly taken out of my mouth what I was going to say. I wanted to give a practical result to your lecture. I do so with great diffidence, because two letters have appeared from Lord Elcho and the Honourable Charles Lindsay speaking against Volunteers being employed for foreign service. If war should unhappily break out, the services of

<sup>1</sup> As political subjects are not allowed in the discussions at this Institution I thought myself called upon to stop, but I believe that without infringement of the rules, and after having alluded to the reaction in other countries against aggressive wars, in which the assailant trusts to the power of compulsory service for success, I might have added that, when the great amount of physical force which is produced by that means is compared with the smaller figures shown by the voluntary system, we must likewise compare the want or the amount of inherent moral force which each of these systems will respectively promote.—T. S. L. A.



every man that can come forward will be required. I think it would then be a very excellent thing if the Government opened a small office somewhere in the neighbourhood of Charing Cross to take the names of men who would volunteer for foreign service. I will confidently assert that out of the 190,000 you would very soon get up a brigade of say 3,000 men for active service abroad, who might be officered in a very short time, and might be fed from that very Volunteer Force which we keep in England as a Reserve. There are thousands and thousands of young men who pay no taxes to the State, living with their families, doing nothing, who might very well go forward and show that the middle class would be just as ready as the upper and the lower classes to face danger and death. I think such a body of men might be a beginning, and might be fed from the Volunteer Force. At all events, I am quite sure if war were forced upon this country you might get from that body a small beginning, say 3,000 drilled men, from whom under an Officer such as I see before me, you would get, not only good, but desperate service.

Mr. LOWE (Queen's Westminsters) here made some remarks regarding taking the colours into action, and regarding the colour of the *fighting* dress of the Army, but not being *à propos* of the subject of the lecture they are not given.

Colonel FLETCHER: There are very few points that I have to answer. With regard to what Major Wetherhed said, my lecture was upon the Land Reserve Forces, not the Naval Reserve Force. I think the Naval Reserve Force would afford a most excellent topic for a lecture. I agree with Sir William Codrington that the great thing is to avoid a ballot if we possibly can, and all that I hinted at was a ballot for the Militia for home defence, which I thought we might be obliged to have recourse to. The object of my lecture was to show how universal conscription, if it is to be avoided, is only to be avoided by extending the channels of volunteering and increasing the means by which an army may be raised. I must thank Mr. Hoste and Colonel Bushby very much for their remarks with regard to the Volunteer Force, which are very valuable as coming from Officers who have had so very much experience of that force. I am very glad to find that my opinions coincide with theirs.

The CHAIRMAN: I think I may venture in one word to take the sense of this meeting with regard to the valuable paper which has been read, and to thank our friend Colonel Fletcher for it. I say our friend because he is alike the friend of the Army and of the Auxiliary Forces. Several burning questions have been discussed, and foremost is that of conscription. I must say I am inclined as an Englishman to depend more upon the spirit of the people for keeping up the sines of war. But in an emergency the ballot may be resorted to for keeping up the Militia, and if we have to do that it would not be at variance with our English institutions; it is not long ago indeed since the ballot was thus employed. That, however, would only be a very partial operation, and very different from a general conscription, which would greatly injure commercial interests. Allusion was made by our gallant friend, in the early part of his lecture, to the possibility of employing our Indian troops, and I think that is a very important question for us to consider. I have heard it said more than once in this country, that if we have war with Russia we might reckon upon India to furnish a contingent of native troops. Now, I have served several times in India, and lately commanded a division there, and I am bound to say that in such a war I would go into action with the greatest confidence at the head of sepoy troops, especially the Sikhs and Gourkas. But there is one point that must be rectified before they can be brought to Europe to join in a Russian War, and that is in the tactical organization of the regiments. The European Officers are too few. They are well trained, well educated, excellent Officers, but they are too few, and the tactical duties assigned to them are altogether faulty. There are only seven Officers to a regiment of infantry, and they are all mounted. At my first inspection of a regiment, I asked their tactical positions or distribution in field movements. They knew of none, except to supervise. When the regiment marched past, six Officers followed the last company, having no tactical command whatever. The companies are commanded by natives very well on parade, but they are incapable of tactical knowledge.

Upon one occasion, at a field day, I purposely drove a brigade through exceedingly rough ground, but such as infantry might have to work through in action, and there was not a single European Officer to be seen with one of the regiments; being on horse-



back, they were all choked off behind. Therefore, although doubtless it would be a great thing to employ native troops in a European war, still it must be under very different tactical arrangements to those adopted at present. With regard to our Volunteers joining the Army, which was another of the subjects discussed, there exists much difference of opinion; our military system is composed of very many branches serving under the provisions of their respective Acts, the regular Army, the Militia, and the Volunteers. Then there are two subsidiary Acts which provide the Army and Militia Reserves. Now four of these admit of service abroad; but the Volunteer Act keeps the Volunteer at home; he is enrolled under the Act of 1863, for the purposes of home defence. Nevertheless, it is only natural that Volunteers should with the whole country be imbued with a desire to maintain the honour of England abroad as well as its defence at home. The only question is—how this can best be accomplished. It has been proposed to organize battalions, or even brigades of those Volunteers, who desired to serve abroad; and I dare say that Her Majesty would be very glad on an emergency to authorize such battalions or brigades of Volunteers under selected Officers, to be enrolled for that purpose, but then they would belong to the Army; they would not be any longer Volunteers under the Act of 1863. Speaking as an Army Officer, I would welcome in the field men who are become almost seasoned soldiers by this time. But as a Volunteer Officer I should say, “God speed you as Volunteers to the Army, but no longer Volunteers “under the Act.” My gallant friend mentioned also the advisability of having camp instruction in the event of war, and I entirely agree with him; it would indeed be absolutely necessary. But instead of selecting the sites of those camps of instruction in strategical localities, I would be inclined to have them rather nearer their homes, and within easy reach of railways, in fact near railway centres; so that the men should be able to follow to a certain extent their own pursuits, and at the same time receive instruction in large bodies to fit them for their duties in the field. I have nothing more with which to detain you, but request that you will join with me in thanking Colonel Fletcher for his very able paper.

## Ebening Meeting.

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Monday, April 1st, 1878.

Admiral A. P. RYDER in the Chair.

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### EXPERIENCES OF A NEW SYSTEM OF LIGHTING HER MAJESTY'S SHIPS.

By CYPRIAN A. G. BRIDGE, Captain R.N.

It has been suggested to me that an account of my experience of the new system of lighting ships of war, introduced as far as I am aware only on board some of the large-sized ironclads, might be to some extent interesting to the members of this INSTITUTION, and possibly even of advantage to Her Majesty's Service. At first it is fitting that what that experience is, should be stated. I filled the post of Commander in an armoured ship, H.M.S. "Audacious," carrying the flag of the Vice-Admiral Commanding-in-Chief on the China Station, for rather more than two years and a half. No person on board was likely to have been more practically interested than myself in the manner in which the ship was lighted. The peculiar duties of an Officer, second in command, naturally make the amount and distribution of light between the decks of the ships to which he belongs, of extreme importance to him. No officer who has held such a post will, it may be confidently asserted, deny that cleanliness, order, and discipline are enormously facilitated by the fact that a ship's decks below are well lighted up. Whatever the class of ship may be, this will be true of her; but in an armoured iron ship divided into many compartments, with few scuttles on the lowest decks, and even fewer arrangements for admitting light to them from above, its truth is even more obvious. Having been second in command of two other armoured vessels, one of wood with flush decks, and one of iron with decks divided by many water-tight bulkheads, and both lighted on the old, or prevailing system, I was able to compare some years' experience of the one with a nearly equal time of the other.

Under the old system, the arrangements for lighting a ship practi-

cally lie in the hands of the Commander, or First Lieutenant. The manner in which it used to be carried out very frequently, suggested to a friend of mine—a second in command of much experience—this forcible and succinct description of it, “It resolved itself into the “Commander’s saying, ‘Hang it! bring another light here.’” This meant, as will be at once seen, that there was no real system or plan upon which the distribution of illuminating power was arranged. When a corner seemed exceptionally dark, its obscurity was dispelled by the simple expedient of putting in it an extra lantern. The number of lanterns that thus got fixed about a ship by the time she was considered to be properly lighted was often very large; and still some corners continued hidden in the blackest darkness, as lanterns giving “all-round” light were scarcely known in our service. You may imagine how much the illuminating arrangements differed in the same ship during different commissions.

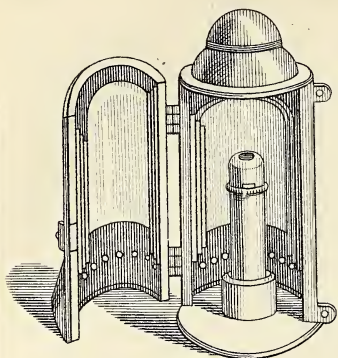
Under the new system, the various lanterns are put up in places decided upon by officers whose special duty it is to discover the best situations for them before the ship goes to sea. In fact, the candle-lighting is just as much a matter of equipment, as the admission of daylight by ports, scuttles, and sky-lights. Illumination follows certain natural laws, and these persons observe them in deciding upon the positions in which to place a lantern. It is not necessary to give an account of these laws here; but it may be stated that two lights properly placed will illuminate, say a quadrangular compartment or “flat,” more effectually and, in parts, even more brilliantly, than four placed in ignorance of the laws alluded to. Having had in former ships to devote a good deal of time,—upon which there were already but too many calls,—to discovering the best situation in which to place lanterns for lighting the decks, I am fully sensible of the advantage of having, in the case of the “Audacious,” had this done for me.

The lanterns supplied to that ship were—the Deck (for fixing overhead); the Wing (for putting against the side); the Bulkhead (for lighting on both sides of a partition); the Hand (for use of Petty officers, &c.).

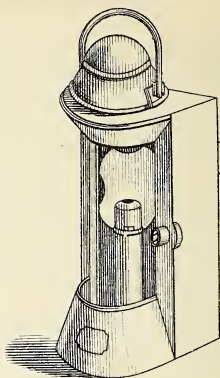
The candle burned in each of the above was of the same size, and was inserted in a tube with a spring and screw cap. The flame was thus always kept in exactly the same position, and the rays, up to the minute even of burning out, fell upon the place to be illuminated always at the same angle. The mess-candlesticks were fitted in a similar manner, and there was, in consequence, no need to shift them as the period of burning drew towards its close. The lamp-trimmers’ work thus could be carried on with much greater regularity, and it was known to within a few minutes when it was proper to go round and replace the candles. At night, instead of handfuls of candles put loosely in a candle-box (which by the way had to be made on board), or of several little 24’s being inserted in each Petty officer’s lantern, where they but too often melted and ran together, some neat tin-trays, supplied fitted from the Government stores, with rows of holes in which were tubes containing candles.

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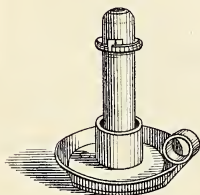




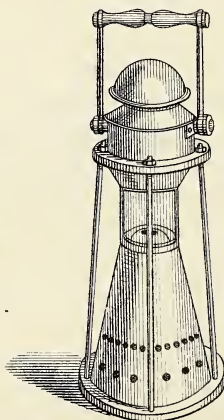
BULKHEAD LANTERN.



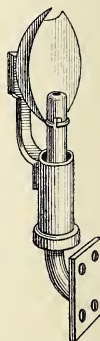
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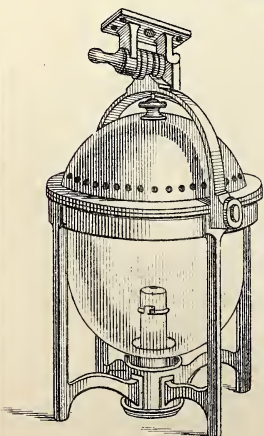
MESS CANDLESTICK.



HAND LANTERN.



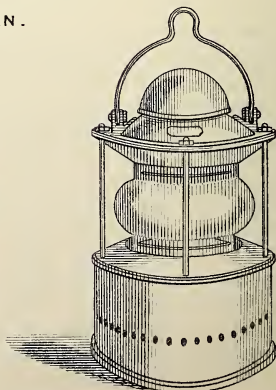
MAGAZINE LIGHT.



DECK LIGHT.



TUBE.



SIGNAL LIGHT.

put into them by the lamp-trimmer, were placed under the sentry's charge, so that the lamps could be replenished during the night-watches by the corporals going their rounds. The reduced liability to dirt and irregularity due to this was marked.

The space beneath the top-gallant forecastle, the heads, urinals, and round-houses, had each a permanent light. The extreme convenience and comfort of this will be understood by anyone who has had to send a corporal of the watch to dig out a missing hand on turn for the look-out, or wait on a breezy maindeck whilst a sentry was lighting a hand-lantern for him, which when obtained would give probably but a respectable glimmer. In the upper battery there were five deck-lanterns fixed overhead; men belonging to the night-watches who cared to read or sew had not, as was often the case under the old plan, to make interest with a captain of a part-of-the-ship for the use of his somewhat dim lantern round which a few would crowd to work. There was light enough for a considerable number, and positions of comfort, on combings, &c., could be selected. In fact the use of the Petty officers' lanterns was to a great extent discontinued, as there was little occasion to take them about the decks, already sufficiently illuminated, to look for anything or any person. Thus the fact that the hand-lanterns, the weakest part of the new system, proved very soon unfit for use did not occasion much inconvenience.

The main battery and half-deck were exclusively lighted—after a few month's trial of a mixed arrangement—by the overhead deck-lanterns. Owing to the flagship being occasionally crowded with supernumeraries, the hammocks were at times obliged to be hung close together; but at no time was there ever the slightest difficulty in seeing the whole deck space between the guns at night, a thing which no arrangement of the old-pattern lamps would have rendered possible. The same advantage was even more fully experienced in the compartments, or "flats," of the lowest deck. Wherever overhead-lighting was adopted—as it was, either by itself or combined with other lamps, in every flat—at night it was possible to see every seam in the deck. Even behind chests, and in the passages between bag-racks, I frequently tried to see if I could read the numbers painted on the lower tier of bags, and was always able to do so with ease. The superiority of the overhead light over the light fixed against the ship's side was well exemplified in the tiller flat. There, one overhead candle illumined the whole deck, whilst two wing-lights of exactly the same power merely lighted up a limited range in front of the reflectors. Nevertheless, the latter were the more striking in appearance to those who prefer seeing a brilliant light to having it usefully cast upon places which, without it, would be in darkness.

The objection to the overhead plan of fixing lanterns is that they interfere with the comfort of men in their hammocks. This certainly deserves consideration; but our experience was that anyone—for by no means every person does—who found himself incommoded by it, in general succeeded in rigging up some sort of screen (a towel on his lashing was a common mode), which hid the light from his own eyes and did not interfere with its general distribution. Men, especially

those confined to their hammocks by illness, were frequently able to read in them—a practice which must have been a comfort to many, and which no attempt was made to discourage. As a rule the lanterns were absolutely smokeless. White-washed beams and painted bulkheads did not suffer at all, or at the worst but very slightly, from that pest of all other lanterns yet in use in the Service—smoke. In ships in which so large a number of lanterns has to be kept continuously alight, as in the heavy ironclads, this is a great thing.

A lantern constructed to give light when placed high up, as in the new-pattern deck-lantern, has many advantages over those only capable of being fixed low down or of standing on the deck. In general, the whole space of the overhead-deck is available, particularly in iron ships, where the beams usually are so shallow. The proper illuminating point at which to put the source of light—a spot which the natural laws spoken of before discover for us—can generally be made available. When we have to fix a light against the side, we are naturally confined to the four sides of a flat for a position. We cannot get one near the centre. This often compels us to make two lamps do the duty which, if properly placed, might easily be done by one. Low elevations, such as hatchway combings, magazine handing-room scuttles, Downton's pumps, &c., interfere with the rays of a light placed near the deck, and oblige us to select situations for it clear of their obstruction. The field of choice is of course limited in other ways. For example, in a bag flat, where there is a lane between the racks, an overhead lantern can be so put up that it will illumine the lane and the midship part of the flat as well. In the "Audacious," on the port side, the bag-rack extended the whole length of the flat against the side. Further amidships was the Marines' rack, in which there were bags about four or five tiers deep. Above the top bag, was a space which permitted the light to shine down into the lane and at the same time to illumine the gangway between the doors of the flat. At night, even in the lane, there was no part of the deck upon which a shilling might not have been seen. Now had we used lamps obliged to be fastened low down, as the police lamps and wing lamps of the Service pattern, it would have been necessary to have arranged a special system of lighting for the lanes, and another for the gangways between the water-tight doors. As it was, the flat, even when lighted up for "Quarters," had only six overhead lights in all; and one special wing-light which took the place of a binnacle and telegraph light near the fighting wheel. It will at once be seen that space over such things as drinking tanks, fire tanks, chests, lockers, main-deck bitts, &c., can be easily made use of to fix suspended lights on; whereas, naturally, they could not be placed where these things are lower down. So, too, when the space between decks is high, a lamp can be placed directly in the gangway, if above our heads, without in any way interfering with traffic. Thus an excellent illuminating position is obtained. The lamps themselves are much out of the way whilst up between the beams, and can always be kept *in situ* with convenience, thus preventing a crowded lamp-room. The white-plated overhead lights in use in the "Audacious" were easily cleaned, and were, in the opinion of many, an ornament to



the decks. The higher the burning light is placed, the less chance is there of the temperature of the air between decks being raised unpleasantly, the heated air being already near the deck above, and consequently closer to its point of escape.

The deck-lamps in the batteries being placed overhead were in the position which experience has shown to be the best for fighting-lanterns. This was another advantage of the new plan: when the bugle sounded for "Night quarters" there were no fighting-lanterns to light and put in place. The gun-decks had as much light as was wanted whilst the guns were being cleared for action. It was found that these lights, when placed *beneath* heavy guns, went out on the latter being fired. Some simple arrangements fitted when the ship was on her station, to a great extent diminished this inconvenience, though it did not altogether remove it. A few experiments made in a Naval dockyard would probably put an end to it altogether. The flat in which the magazines and shell-rooms are situated, being usually that immediately below the central battery in armoured ships, would be more securely lighted for action if stout panes of glass were inserted in the water-tight bulkheads, and, at quarters, the whole illumination of the magazine compartment were—as in an ordinary light-room—placed outside it. This would remain true whatever system of lighting were used in the ship.

With regard to the lighting of the ship's company's messes, it may be said, in general, that a candle of about the same size as that in common use in our houses replaced the tiny taper about the size of one's little finger; that a neat spring tube, exactly like that in use in many officers' cabins, capable of giving a complete all-round light, replaced the tin sconce which could only illuminate half of the circle around it. The tubes fixed in the mess-table enabled the men to read, write, and sew by candle-light, and less trouble was experienced than in any ship in which I have served, in stopping the dangerous and dirty practice of each man sticking a little candle-end (previously filched from a stray lantern), on the lid of his ditty-box in order to work by its light. The "standards," as they were called, in which the tubes were inserted, and which supported a circular reflector working on a pivot, and capable of being turned in a horizontal position to throw the light upon the table, or in a vertical one and so cast it horizontally, were soon left out of use. They offered a tempting step by which to get into a hammock, and being soon highly heated were likely to burn a foot placed on them, besides being easily injured. In the lower mess-deck they were found convenient at inspections as they threw a bright light upon the mess-shelves otherwise left in obscurity. The tube system of lights in each mess contained several elements of comfort and convenience. There was no grease falling about; they were neat and sightly, and could be easily shipped in the candle-sticks supplied and be made portable. Placed in order on the deck at morning inspection, their condition could be readily seen to, and they were easily collected by the lamp-trimmer for cleaning and refilling during his working hours in the lamp-room. The whole candle was usually burned in the tube, and the last inch or two of it



was not useless for lighting purposes by being, as with the old plan, in reality nothing more than an end for insertion in the socket of the sconce.

The hand-lanterns were the least successful of all. They were neat, strong, and easily cleaned, and being put together with screws and nuts instead of solder were capable of being repaired by using parts of other lanterns; they gave an admirable light; but the glass tube surrounding the flame was too small in diameter and quickly cracked if not held perpendicular. Complaints were often made of the danger to the hand of a person carrying them from the heat of the upper portion. But all hand-lanterns when lighted get very hot in the roof, and the new ones were only hotter than the old in the proportion of the excess of their illuminating power—due to the larger candle—over that of the tiny 24 in use in the Service pattern. So many glasses got broken that in practice the use of the hand-lanterns was almost discontinued. The ship was so well lighted with continuously burning lamps in all parts that they were not much missed. I should suggest that a slightly increased number of fixed lights be used, and that with the exception of a few “dark lanterns” for the use of the ship’s police, and a special lamp for boat service, hand lanterns be altogether discontinued. The fixed lights could always be placed in holds or tiers, when necessary, during provisioning, &c.; and for getting hammocks down it might be made part of the regular routine, that at the pipe, “Unlace hammock-cloths!” the lamp-trimmer should light two or three fixed lamps to illuminate the nettings until they were clear. In harbour a fixed light at the gangway with a movable shade would advantageously replace the side-boys’ lanterns. I was convinced that the “fixed light” plan was capable of greater extension than even it had attained in the “Audacious.” I would have done away with all the mess table lights and have increased the number of overhead deck-lanterns on the lower deck, of which only a certain number should be kept burning after the order “Out lights” before the Commander’s rounds. It was not easy to see why a large room, as a man-of-war’s lower deck really is, should be lighted differently from those in hotels, clubs, or even in private houses, or for the matter of that from a wardroom. Two or three lamps in the latter do all that is required by often nearly twenty officers. The locking arrangement of the bulkhead lights was not sufficiently secure, and the bolt could easily be turned by an ordinary knife.

I have no hesitation whatever in recording my conviction that the “Audacious” was not only the best lighted of Her Majesty’s ships of which I have any knowledge, but that she was the only one properly lighted that I have ever seen. In no open part of the ship was there any considerable space which at night was not well illuminated. The lamps were slightly, easily kept clean, remarkably free from danger, and almost absolutely smokeless. They could be kept always in place, and thus the liability to damage due to repeated removal to and from the lamp-room, was minimised. This will be realised by any one who has compared the amount of breakage in the case of a moderator being continually moved from pantry to sideboard, side-

board to table, and back again to pantry, with that in the case of a gasalier always in the same place. There is, no doubt, a less striking appearance presented by the decks of a ship with the new lamps than by those of one with the old. Nothing, all must admit, can be more splendid in this direction than the blaze of the great police-lamps of the Service. They are positively dazzling, and if their chief duty was to throw a brilliant glare upon the feet and ankles of the sentry, over the bags, for instance, nothing could be more perfectly carried out. But behind, and by the side of them there is a region of nearly impenetrable darkness, as there is also behind any object placed in the line of their rays; a man standing in front of one practically puts them out. The new plan is due to the idea that the object to be served by a lamp is not that it may be looked at as a brilliant thing, but that it may illumine dark places. If the curiously-shaped gas lamps hung outside jewellers' windows in so many parts of London were turned with their backs to the houses, the effect in such streets as Oxford Street or the Strand undoubtedly would be very fine; but the wares exposed in the windows would be absolutely hidden in darkness. Go down into a flat of the "Audacious" fresh from the sunlight of the upper deck, and, missing the glare of the police-lamp, the want of light seems striking, but go there at night and you will find light enough for almost anything you can require to be done, though probably not a single candle-flame will catch the eye. The real object of artificial light after all is, except on festivals, to give light and not to be looked at.

Of the signal lanterns I had not much opportunity of judging by comparison with others of the Service pattern. Ours were smaller than the copper ones lately in use, and gave an excellent light. They were at the least as brilliant as any I have seen before, and certainly of more convenient dimensions. Being of the same metal as the other lamps, they did not require to be cleaned with oil or brick, a fact which we had frequently occasion to notice when comparing the results of the signal-boys' work upon them and upon the flag and flashing lights, which were copper of the older pattern. A trifling rearrangement of the bow and swivel at the bottom for the signal halliards would enable them to stand upright on the deck, which they do not do at present.

I have thus tried to give an account of my experience of this plan of lighting Her Majesty's ships, and I have not felt called upon to go beyond that. Suggestions for the extension of the system to other and smaller vessels have frequently occurred to me; but that does not come within the scope of this paper. I hope, however, that a few words in allusion to the important pecuniary saving due to the new plan may not be out of place. A ship of the same design as the "Audacious," lighted on the old plan, burnt on an average about 15,300 lbs. of candles of various numbers a year; the latter vessel, lighted on the new plan, used an average quantity of 10,900 lbs., a saving of nearly 30 per cent. The money value of the saving was, on an average, £159 yearly. That is equivalent to a saving every year of more than one-fourth of the total cost.

Experience convinces me that if the new system were in use in every ship in the Service, all would be better lighted, and the figures I have given, and on which I believe reliance can be placed, show that this could be done at a gain of many thousand pounds to the country. The plan has this obvious merit: it is not some ingenious invention protected by a patent; it is the result of experience of what is wanted afloat, of common sense, and of a few important, but distinct natural laws.

The CHAIRMAN: I suppose Captain Bridge in asking me to take the chair this evening did so because, as this experiment was tried in the "Audacious," my flag-ship, he thought I might be able in some small degree perhaps to contribute to the information given to-night. I was fortunate on arriving at Singapore in the "Audacious," in 1875, to meet a sister ship, the "Iron Duke," the flag-ship, leaving the station with her lamps lit on the system then in force, and now in force, and therefore, although we were only three days in company, the opportunity was afforded me of appointing a joint committee of an equal number of officers from both ships to visit both ships, by night and by day, to compare the two systems, and make a report to me as to their opinion on the merits and demerits of the two systems. That report of course was sent home to their Lordships, and making due allowance for the partiality which many of us feel for the systems, whatever they may be, under which we live, and with which we are brought into close contact, that report was decidedly in favour of the new system. Especially was it so on the question of economy. We had been long enough in commission to ascertain what was the consumption. I believe it was diminished afterwards, as the Officers and men became more familiar with it; but the economy was, as you heard just now, very considerable; indeed, it was 30 per cent. And when you consider what that is if extended over the whole of the ships of the Navy, you can easily see what a large economy it would be. I believe I am not wrong in stating the economy amounts to about £10,000 a year, which is a considerable sum in these days. Of course the first cost of this system, as far as the plant goes, is larger than with the old lamps. These new lamps, however, are stronger and better made, but the wear and tear is very much less than with the lamps of the old system, so that after striking off what you would have to strike off for interest on extra outlay, I think you would find you might throw the whole question of first cost, as compared with the first cost on the other system, on one side, and look at the matter simply as regards the annual expense of illuminating material, the saving on which amounts, I am informed, to £10,000 or £12,000 a year. If, therefore, a system has been devised which gives us better light by distributing it widely, which is the real secret of the new system, instead of condensing it in certain directions; if we have got rid almost entirely of smoke; if we have got rid of what was a nuisance on board ship—the facility for pilfering candles; if we have put the light close up to the deck above, where it really is close to the vitiated air, so to speak, and does not contribute to that vitiated air, because, as you can easily understand, the magnificent police lights, which are near the deck, heat the air close to them, and that air ascends to the hammocks, while these lights are put above the men; therefore you save largely on the score of coolness and non-vitiation of the air; if, I say, all these points have been gained, together with cleanliness and economy, then it is to be assumed that the system will very soon become universal. I cannot myself suppose but that it will do so when their Lordships have leisure to turn their attention to this among various other matters, which no doubt are necessarily put aside for a short time. I do not think I need trouble you with any more observations regarding this system of lighting, except just this: that the Royal United Service Institution invites, as you know, all inventors of matters connected with the Army or Navy to come here and read papers and explain their inventions. At first sight, some persons perhaps who are not acquainted intimately with the subject, might suppose that this system of lighting is the work of an inventor, who has sent the lamps here, and who has read a paper on the subject. This is not so. Captain Colomb, who devised the new system of lighting, did so when specially employed by the Admi-



ralty, and appointed for the purpose of investigating the whole question of lighting men-of-war. This system, therefore, is not his invention in the sense I have just been speaking of ; it is the result of a very careful, long, and arduous inquiry on his part for their Lordships. I cannot but believe that Captain Colomb's system of lighting men-of-war will be adopted in the Royal Navy, and add another to the valuable contributions he has made to the service of which he is such an ornament. Our thanks are due to Captain Bridge for preparing this paper, which has, I well know, been a labour of love.



# LECTURE.

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Friday, April 5th, 1878.

GENERAL SIR T. MONTAGUE STEELE, K.C.B., &c., &c., Commanding Aldershot District, in the Chair.

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## I. THE ARMAMENT AND ORGANIZATION OF CAVALRY AND THEIR INFLUENCE ON ITS TACTICS.

## II. SUGGESTIONS FOR OBTAINING CAVALRY RESERVES.

By Major S. BOULDERSON, 17th Lancers.

I WISH it to be understood that this is not a lecture properly so called, but merely a paper, for it seems to me that a lecture implies that the opinions given are those of a person well qualified to teach, in fact of an authority on the matter, and to such a position I do not for a moment presume to aspire: my object is simply to put the subject very shortly and imperfectly before you, and to elicit either now, or at some future time, the opinions of men able to judge, with the view of correcting my own errors, and of doing good to a service of which I am proud to be a member.

With regard to armament and organization, the points upon which I wish to raise discussion and to throw light are as follows:—

1st. Firearms. Whether cavalry throughout should be armed with them, or only partially so in each regiment.

2nd. Whether the difficulty can be got over, or lessened, by the employment of mounted infantry; and if such corps are ever adopted, what is the proper place for them in our military system?

3rd. Respective value of the lance and sword, separately, combined, and with or without firearms.

4th. What is the best armament for British cavalry?

5th. The effects of these different armaments and organizations on cavalry tactics.

### *Armament.*

In January last, Mr. Graves, 20th Hussars, in his paper on "Military Equipment,"<sup>1</sup> entered into the question of the armament of cavalry, but until I had written my paper, I had no idea of the existence of

<sup>1</sup> See Journal, vol. xvii, No. 94, page 120, *et seq.*

his; it is, however, a subject of such importance, that I think it will bear fuller investigation and discussion than he, amongst other subjects, was able to give it.

Mr. Graves sums up his opinion of the proper armament for our cavalry, in these words. "It is my firm belief, that the front rank of all regiments should be armed with lance and revolver, and the rear rank with sabre and carbine."

Now I have quite independently come to a somewhat similar, yet a somewhat different conclusion, the difference consisting in my disagreeing with his proposal for revolvers. Instead of revolvers in the front rank, I would have the sword, as I think the lance cannot be separated from it, and that revolvers are dangerous.

#### *Firearms.*

A great many cavalry Officers, no doubt with great reason, argue that it is a mistake to put firearms into the hands of the cavalry, for they will be found at the critical moment handling their firearms instead of charging; but against this it may be said that so long as carbines only are used, our rule never to allow any man to fire mounted partly meets the objection.

If, however, the recommendations of revolvers are carried out, weapons which are very apt to be fired off mounted and possibly on the slightest provocation, the objection remains in full force. An Officer once told me that he has seen men in our cavalry, fire mounted in the ranks, without any orders; and just fancy for a moment a *mêlée* in which lancers used the revolver; how many shots would actually hit the man fired at? Would not bullets be flying in all directions? and if so, would it not be a case of "save me from my friends?" There is also the danger of being cut down if you miss your man, and further still there is an awkwardness about a lancer using a pistol, for he must either sling his lance on his arm, or hold it across the saddle in his bridle hand, either way being dangerous to his comrades, or if he insists on using his pistol, might he not drop the lance altogether? Yet it is generally admitted that firearms are necessary either throughout every regiment, including lancers, as at present in our service, or by partial armament with them in each regiment; or again, by having certain corps, such as mounted rifles, the Russian dragoons, &c., to do the dismounted work.

During the 1870-71 campaign, the German Uhlans were obliged to arm themselves with chassépôts to protect themselves against the Franc tireurs, &c., and I believe the Russian cavalry have met with considerable difficulties in the firearms of the Bashi Bazouks during this last campaign. The pistol has therefore gradually given place to the rifle or carbine, which I think must be accepted as the proper firearm.

#### *Pistols.*

Nevertheless, should it be decided at any time to give the front rank of Lancers, or any part of them, pistols again, I would advocate a single-barrelled breech-loader, to be carried on the right side of the

man, the object of the pistol being to protect the man if his horse is killed, and never to be fired mounted, except for the purpose of giving an alarm on outpost duty, &c.

It is an unfortunate circumstance that no pistol, unless enormously heavy, could be made to fire the Martini-Henry ammunition, the recoil being so great that no man's wrist could stand it. Mr. Reilly, the gunmaker, I understand, tried it, and the man's wrist was nearly broken.

The Russians, I am informed, have had many accidents with revolvers in this last war.

Now, if no pistol is carried by the front rank, in fact no firearm, those men could carry half the ammunition for the rear rank. In patrol or vedette duty, one lancer from the front rank, and one rear rank man with carbine, could be detached together. Therefore, for the reasons given, I believe it is better not to put firearms into the hands of the front rank at all, but if you give carbines to the rear rank only, you will have as many as you can use, and in the hands of the best shots, and the most intelligent men.

Again, when formed up in double rank for a charge, no rear rank man behind can well fire off his carbine through the front rank on seeing the enemy, and if he attempts to touch it, would be seen by the *serre-files* behind him.

#### *Mounted Infantry.*

It must be understood that I do not advocate the adoption of mounted infantry in the place of cavalry, for I believe that they make bad cavalry and indifferent infantry. But having war in view, and it being admitted that we may have to furnish three corps d'armée from Great Britain, and that six cavalry regiments per corps are required, I say that they can be raised from the infantry of the line, the militia, and perhaps even from the volunteers, far quicker than cavalry; and for this I have a plan to suggest. I propose, therefore, that if our cavalry force is no larger than at present, and that arrangements are not made to supplement it from India, and that we are suddenly called upon to enter on a great war, we might have three regiments of mounted infantry as divisional cavalry for the third corps; and that is, if used at all, I think their proper place. As this question of place comes under the head of tactics, it will be discussed further on.

Many authorities object strongly to mounted infantry, or rifles, and Schellendorf, in his second volume "On the Duties of the General Staff," is very decided in his opinion against mounted infantry.

Again, many think very highly of them, judging chiefly from the experiences of the American War, and advocate the use of mounted riflemen as *éclaireurs*, leaving the cavalry proper armed only with the lance and sword, employing them chiefly for shock combat on the field of battle, in fact bottling them up for special occasions, and to act in support of the mounted rifles, which are to be considered as light cavalry, and the ears and eyes of an army; but, in my humble opinion, it would be a mistake to push out mounted infantry (call them rifles or dragoons if you will) to the extreme front, and expect them to per-



form these duties—horsemen, the most highly trained and most self-reliant, are alone capable of playing this rôle. The Russians have still dragoons, which have been organized as mounted rifles. These dragoons were armed with long rifle, sword, and bayonet, but lately have been re-armed with the Berdan breech-loading carbine, or short rifle, retaining both sword and bayonet. The armament, however, points to the tactics, and I maintain that the tactics of these troops should be those of infantry, able from their mobility to support artillery, cavalry, or infantry, as may be required.

Now, if it is ever decided that this sort of regiment is required in our Service, I wish to point out a plan for raising a few regiments in from four to six months, without drawing on the cavalry for a man, or a horse. Call for volunteers from the line, the militia, and the volunteers, taking only drilled men, who can shoot, and are of good character; give them infantry Officers who can ride (the main difficulty is non-commissioned officers), and attach them to cavalry regiments, say one squadron to each regiment, to learn their stable duties, and to ride, &c.; I am sure, from my previous experience, if well selected, they will learn this in four months.

To give an example:

In the spring of 1857 (the Mutiny year), Sir Sydney Cotton organized a corps, called the Peshawur Light Horse, composed of 200 Europeans, and 100 natives; half the Officers came from the infantry, and half from the cavalry; the Europeans were English infantry, picked from all the four regiments in his division, viz., the 24th, 27th, 70th, and 87th regiments; the equipment and trained cavalry horses were all ready for them; and in four months they were taught to ride, and were immediately sent a march into the district, and to encamp out some time, thus becoming shortly very efficient as cavalry.

This proves, I think, that infantry soldiers can be taught all that mounted infantry would require in four months. Major Lockwood, 20th Hussars, who belonged to this corps the whole time it was embodied, can bear me out.

#### *Respective Value of the Lance and Sword.*

The lance is the best and most deadly weapon, for all shock encounters, in pursuit, or in single combat, which last our annual competition will show (its bad point being in the *mêlée*); its moral effect also is very great, as was shown by the 9th Lancers in the Indian mutiny, where the mutineers used to throw themselves down on the ground, hide their firearms, and then jump up after the cavalry had passed, and fire at them; they used also to cut and wound the Hussars' horses as they passed, who were not able to reach them. The Lancers however, invariably ran their lances through them; and such was the terror inspired by the Delhi spearmen, as they were called, that the enemy used to begin to run when they were miles away. For the Hussars they cared very little. The lance is spoken favourably of by Captain Hozier in the 1866 campaign. If all this is admitted, and is true, you will find that early in a campaign, the moral effect of this weapon will make itself felt by those possessing it, as against those



without it. It follows therefore, that if we are pitted against the Russians, for instance, who have their front ranks all armed with the lance, except the Dragoons, we should be at a disadvantage as regards first encounters, at any rate, and the superiority of our men would have to restore the balance.

v. p.  
332. I wish to dwell particularly on the moral effect of the weapon, the infantry even having a high respect for it. Napoleon held that the moral is to the physical force as three to one, and no one knew more about that than he did. The Germans also thoroughly believe in it; therefore, if by any means the *morale* of one cavalry can be established ever so little over that of the other, those means should not be neglected.

The question of *morale* decides which cavalry shall have a grasp on the greatest extent of country, and the consequent advantages that ensue to its own side.

Some people argue that, because the French have entirely given up the lance, it is fair to suppose they had good reason; but their reason, in my opinion, is simply because they are not naturally good riders, and it is generally admitted that the lance, to be effective, must be in the hands of a good rider. Now are we not good riders as a nation? and if so, are we to throw away the weapon which is especially suited to our national characteristics?

If anyone doubts our being able to use the lance, let him come to our annual competition, and I am sure he will be convinced.

Then why handicap our men by giving so few of them a weapon that they are quite competent to use?

The proportion of lancer regiments in our own and foreign armies is as follows:—

English—1 to 5.

Austrian—1 to 3.

German—1 to 3.

Russian—All regiments except dragoons.

France—None.

The proportion, therefore, is decidedly against us.

### *The Sword.*

As to the sword, it is an excellent weapon for all purposes, but not equal to the lance in the charge and in certain cases, although I think that the lance cannot possibly do without it; it seems to be a necessary adjunct; in the *mêlée* the lance requires its support (for examples of this, I refer you to Mr. Graves's paper). Why, then, not have the sword in close support to the lance?

I therefore come to the conclusion, that lance in front rank and sword in rear rank is the best arrangement; but now, as I came to the conclusion that firearms should only be carried by the rear rank, I want a second weapon for the front rank, and I think it should be the sword. A lance is liable to stick in the enemy's body, or in that of his horse, and be pulled out of the man's hand, and be broken; it may have done its work, but still the owner is defenceless; and what so good in the *mêlée*, that is probably going on, as a sword to fall back upon?

I prefer the sword to the sabre, as the point is the attack to be insisted on. I look upon a sabre to mean a more curved blade than a sword.

*The best Armament for British Cavalry.*

To sum up, therefore, I consider the best armament for British cavalry is (provided a majority is so armed), lance and sword in the front rank, sword and carbine in the rear rank. This seems to me to dispose at once of the question of over-armament of lancer regiments, and of the extra weight of the three arms; and the more this plan is examined, the more, I believe, will all difficulties be found to disappear.

The only objection I can foresee is, that it may be said, how are the front rank men, when employed as vedettes, &c., to give an alarm without a firearm? My answer is, never employ a front rank man without his rear rank man, who has a carbine; and out of this a mutual reliance would grow, similar to the much-praised one that used to exist between front and rear rank in the infantry.

It may not be generally known that our lancer regiments are now armed with lance, sword, and Martini-Henry carbine in both ranks, the objection to this being, according to some opinions, that a man is over-armed and over-weighted, and has no easy way of getting rid of his sword and lance, on dismounting to fire.

Last year I had command of my regiment at every brigade or divisional field-day, and during the summer manœuvres, when there was frequent occasion to use the sixteen carbines per squadron, which we then had, and in one squadron we tried a new sword-belt, slung from the right shoulder and passing to the left side, with a frog in which the sword was placed loose, and an extra leather frog hung from the saddle into which the sword was transferred on dismounting; to this sword-belt was also attached the ammunition pouch, with an expense pouch for ten rounds, carried on the girdle. I am sorry to say all the men who tried this belt said it made their shoulders ache, and if ball ammunition had been carried it would have been worse.

Now, if a lighter sword were issued it could be carried on the waist-belt through a frog, and thus be removable. Two ways of getting rid of the lance were tried, one by placing the butt-end in the bucket of the stirrup and strapping the pole to the wallet, when it stands upright, but in woods becomes very inconvenient; the other by the man who leads the dismounted man's horse, slinging his lance on his bridle arm. This last arrangement does well enough at a walk if the horses are not fresh, but I had to give strict orders not to exceed this pace for fear of accidents. Yet I maintain that fresh or not (and on service they would be steady enough), if you were to drop a shell amongst them, the men could not manage them with a lance on each arm, and would run their lances into each other, or into the horses. That is why I argue that a man with a carbine is better without a lance.

Nevertheless, I consider our present armament very good; and if you can excuse the weight of the three arms, and, considering the

small proportion of lancers in our service, we are perhaps best as we are.

### *Foreign Armaments.*

*France* (see armed strength of) had up to last year her cavalry armed as follows:—

Cuirassiers—sword and revolver.

Dragoons, chasseurs, hussars—sword and carbine on the Gras principle, the latter being slung over the men's backs.

No lancers.

*Austria*.—I cannot obtain the information, but eleven out of forty-one regiments were lancers up to 1873.

*Germany* had up to 1876 (see armed strength of) cuirassiers—sword and pistol, with exception of sixteen men in each squadron who have carbines.

Dragoons and hussars—sabre and carbine.

Lancers—lance, sabre, and pistol, with exception of thirty-two men in each squadron who have carbines.

Since then they have been armed throughout with carbines, so that every man has lance, sword, and carbine like ourselves.

On dismounting, the lancer removes his sword and fastens both the lance and the sword to the saddle with his surcingle, placing the butt of the lance in the bucket. This, however, is a long business, both in mounting and dismounting.

*Russia*.—The armed strength of Russia is a translation from the Austrian edition of 1871, and is of no use now. From private information—not official—I learn that the cavalry throughout, except the dragoons, are armed with lance, sabre, and revolver in the front rank, sabre and carbine in the rear rank.

The Cossacks have usually lance, sword, and gun.

### *The Effect of these different Armaments and Organizations on Cavalry Tactics.*

The more the matter is examined, the more it will be seen that the questions of armament and tactics are intimately connected, and if you tell me how a regiment is armed, I will tell you what its tactics ought to be.

To take a plain case, if you give a mounted man a rifle and a bayonet, he is a mounted infantry soldier; but if you give him a sword and carbine he is at once a hussar. Now suppose one of our lancer regiments before we had firearms engaged with a hussar regiment; the hussars would have had the power of attempting to hold the lancers in front with firearms, while they attacked them, mounted, in flank. Plenty of ground can be found where such tactics could be employed with advantage. The lancers, on their side, must defeat the mounted portion of the hussars, and then threaten the horses of the dismounted men before they can get rid of their fire, which may be delivered from behind a ditch or other obstacle in comparative safety.

Now, if we take the lancers armed with carbines, they can meet the enemy's fire; and I think so highly of the lance, and of our cavalry,



that my belief is that the mounted lancers could afford to form in single rank, thus showing a superior front to the enemy, if of equal numbers, and consequently having the power to attack him in flank and front at the same time.

I think lancers are especially suited to single rank formations, and our rear ranks are still kept too close to bring their lances down to the position of the charge with safety to their front rank men, and actually do charge, with their lances at the "Carry," and so might be cut down by a swordsman before they knew where they were.

Now, as to mounted infantry or rifles in conjunction with cavalry, I have before said I think their place is as divisional cavalry. There they are under the hand of the corps-commander, to be massed or despatched on a raid if required; and if not so used, they are better able than cavalry proper to take care of the flanks of their own divisions and to assist in turning the flanks of the enemy. They can rapidly support any threatened point; they can be pushed to the front at the commencement of an action, to support the corps artillery, often hard pressed, before the infantry comes up; and, finally, during the march into an enemy's country they can keep connection between the cavalry, which is ahead, and the infantry divisions, supporting the former when any serious hindrance occurs to their forward march.

In a letter to the *Times*, published in that paper on 2nd April, Captain M'Calmont, speaking of Mr. Forbes's proposal for a special Reconnaissance Corps, says:—

"Sir Garnet Wolseley's suggestion in the 'Nineteenth Century' to increase, as I understand it, the numbers of light cavalry by special corps of mounted infantry is a very different thing. Under a proper organization their assistance would be valuable, while they would not supersede the regiments already highly trained for the specific purpose of 'scouting'."

This supports my view of the divisional cavalry being mounted infantry.

#### *Suggestions for a Cavalry Reserve.*

Discharge by purchase has recently been stopped for a time, but on its being re-opened, I would suggest that a man purchasing such indulgence should be obliged to enter the Reserve.

If this had been done during the five years ending December, 1877, my regiment, the 17th Lancers, would have had 146 men, the 4th Dragoon Guards 160 men, the 5th Dragoon Guards 157 men, of the average service of three years in the ranks belonging to the Reserve; these three regiments are on the foreign service establishment, while on the reduced establishment follow the 2nd Dragoon Guards with 110, 7th Hussars 87, 19th Hussars 69, and 3rd Dragoon Guards 62, all of the average service of three years; and it must be borne in mind that men who purchase their discharge usually come from a higher class in life than the ordinary soldier, and are, therefore, better educated.

Just fancy how comparatively comfortable a regiment would feel, entering on active service, with such a reserve to fall back upon.



Instead of which there is no Reserve at all.

Now, I think it quite possible, that if you offer to take back these men on proper terms you will get some of them.

I propose, therefore, after medical examination, to offer to take back any men who have purchased their discharge within a reasonable time, returning them the money they have paid, with the certain option of joining their own or any other regiment they choose, and of claiming their discharge free at the end of the war; being also allowed at once to count their previous service towards good conduct pay, &c., while serving, and on discharge to be given deferred pay for their previous service, as well as the time of their service during the war.

They will have thus a monetary inducement, both on joining and on discharge. I maintain that it is not dear, but cheap, to pay this price for such men.

They should also be told that if married, their families would receive an allowance during their absence, for these families might not like entering a barrack; and no chance of getting the men ought to be thrown away. To show the endless work entailed on the regimental staff in these days, I may mention that 434 men have passed out of my regiment in the five years named.

When I had nearly finished my paper, my attention was called to a lecture delivered by Colonel Evelyn Wood in this Institution, in March, 1873, on "Mounted Riflemen," and on reading it my hopes of being original fell to the ground; it, however, supports the views I had perfectly independently formed, and points out better than I could, the effect that armament has always had on the tactics of cavalry. I propose, therefore, to read you a few extracts. Colonel Wood states the late Field-Marshal Sir John Burgoyne wrote: "The art of applying mounted infantry to the greatest advantage is as yet unknown."

Colonel Wood adds: "He goes on to record his opinion that such troops should not be allowed to grow into cavalry. He thought it was worthy of consideration whether cavalry should not be divided into two perfectly distinct services; one of heavy cavalry, to be held in reserve with an army in the field; and the other to be attached to divisions, and to partake more of the characteristics of mounted infantry than of the hussars of the present day."

He also adds: "Before our next war, the following points must be decided:—

"1stly. Shall a portion of each cavalry regiment, or some regiments, be converted into mounted riflemen? or

"2ndly. Shall some system be adopted to enable a small number of light infantry soldiers to move with mounted corps?

"I think all thinking soldiers are agreed so far; it is, therefore, only necessary to ascertain which plan is the more suitable for the British nation. I venture to argue that to attempt to make mounted cavalry soldiers compete on anything like equal terms with infantry would be as unsatisfactory as it must be expensive."

Speaking of Frederick the Great, he says: "After the battle of Mollwitz, where his cavalry was thoroughly beaten, he laid down two rules for its guidance:—

“ ‘ 1st. Cavalry Officers awaiting an attack will be cashiered ;

“ ‘ 2nd. The attack is to be made without firing, the last 200 yards  
“ ‘ at a gallop.’

“ ‘ It was natural that the French cavalry should copy their victors, who had abolished all firing, but they appear to have copied without comprehending that the duty of a dragoon, properly so called, is quite different from that of a cavalry soldier. Under Louis XVI, better known for his misfortunes and cruel fate than for his military genius, the dragoons were transformed into cavalry.’ ”

Colonel Wood adds in another place : “ It appears to me that it is only those Officers who have led cavalry into action, and have seen their demeanour when actually striving for life, who are competent to decide whether or not the constant use of firearms does or does not injure their dash. Unfortunately there are not many to ask, but one of the few, in writing on this subject, thus states his opinion : ‘ Cavalry must be armed with firearms, but if used as ‘ infantry, it will very soon lose faith in the sword and lance, and ‘ will become quite useless as cavalry. You will never get them to ‘ do what they did at Balaklava and Rezonville.’ There is a well-known story of a British cavalry Colonel, who flung his pistol into a pool of water when parading his regiment before going into action— a forcible hint to his men to trust to *l’arme blanche*. In August, 1854, at Beuseo, nearest Bucharest, Major O’Reilly, leading Turkish cavalry, being about to charge some Cossacks, rode along his line, and found every man with his lance slung, his sabre in the scabbard, and his pistol cocked. When he induced them to put by their pistols and charge, the Cossacks were so unprepared for this unusual manœuvre that of about 600 only half-a-dozen attempted to advance, while the others fired their carbines and fled. I argue, if you train your cavalry to depend chiefly on firearms, you will not get them to charge ; and for cavalry, considered as such, Frederick’s rules are still good.

“ General Rosser, one of the most distinguished Confederate leaders of mounted soldiers, wrote in 1868, three years after the war : ‘ Cavalry was not used on the battle-fields as under Ney and Murat, because it was not cavalry.’ ”

He quotes Colonel Hamley and says : “ Until the exact position of an enemy is accurately known, the cavalry will be pushed on from 20 to 50 miles in advance of the Army. To obviate the risks incidental to this arrangement mounted infantry must accompany the cavalry. In the advance from Sedan on Paris, 4th September, 1870, we find Von Moltke recommending the Commanders of the 3rd Army and the Army of the Meuse ‘ to send cavalry far to the front, and support ‘ it by horse artillery and infantry in carts.’ ”

And he concludes his lecture by saying : “ It may have occurred to some of you, if this idea is feasible, why do not the Government carry it out ? The conditions of our political life render any extraordinary action by the Government difficult. Suppose the Commander-in-Chief and the Secretary of State for War are agreed on the advisability of creating in the regular Army some such corps as

"I have suggested. After consulting with his colleagues, the Minister learns that a band of well-intentioned but misguided Members of the Legislature will oppose any increase to the Army Estimates, of whatever nature; so he goes to his military colleagues and says: 'I quite agree with you about these riflemen, but you cannot add sixpence to the estimates; so if you must have this new corps, you will have to reduce another regiment.'"

Lieut.-General BEAUCHAMP WALKER, C.B.: It would be a very great pity if so remarkably good a paper as the one we have just heard should pass into the Journal without some cavalry soldier saying something about it. I do not say that I agree in all we have heard from Major Boulderson, but I have seldom heard in this Institution a more suggestive paper, or one containing sounder and less wild ideas. On a great many points it is remarkably good. As regards the question of arming cavalry with firearms, I think that Colonel Wood, in the paper he quoted, seems to have got an entirely wrong idea on the subject. He seems to think because you arm cavalry with a firearm therefore you intend them to use their firearms on the field of battle. None but a madman would think of such a thing. I know the French used to do it. I perfectly remember old Sir Thomas Hawker, Colonel-in-Chief of the 6th Dragoon Guards, telling me that the most successful charge he was ever engaged in, was made by the regiment with which he served in the Peninsula against a French regiment, which moved up in line, halted, gave fire, and knocked over a certain proportion of his regiment, and then, as he said, "We were into them long before they could strap up their carbines." Therefore, it is manifest that using carbines on a field of battle is nothing short of insanity. The wonder would be how anybody could ever get such an idea that such a use of it could be admitted by a cavalry soldier. I, however, would go very far with him in saying that in the present day, and under the uses to which cavalry is now put, a very large proportion, if not the whole, must be armed with a firearm of long range. I do not suppose that anybody ever held a much stronger prejudice on that subject than I did. When I first began my cavalry career, after having been for eleven years in the infantry (of course knowing nothing about cavalry), I set to work to study the subject; I had to ask those who could give me information, and to read and search for the experience which I had to pick up late in life. I formed the strongest possible opinion against the practice of furnishing cavalry generally with carbines, because I found that the consequence of so arming cavalry (unless it was the most disciplined of cavalry, where every man was as well trained as his Officers) was that they would not cut in—they would rather fire the carbine than cut in with the sword. In 1860 the present Lord Napier of Magdala desired me to inspect a regiment of native cavalry in India raised by my friend Walter Fane, which did good service afterwards. I found this regiment armed throughout with the carbine. I went straight to Sir Robert Napier, and reported extremely well as to the general drill and appearance of the regiment, but I said, "Sir, only think, the Government of India have given all the men carbines. You may rest assured these fellows will never charge home; they have very few European Officers, and the end will be, they will stand off as far as possible and fire their carbines, instead of cutting in with the lance and the sword." Sir Robert Napier, after consulting with other Officers in Calcutta, gave me authority the next morning to disarm that regiment, with the exception of twenty-four carbines per squadron. But the times have changed. In those days we did not attach the same importance to keeping the enemy dark as to our intentions, as we do now. We have gained a good deal of experience during the last two continental wars, which shows that if you intend to do any good you must keep your own intentions dark, and at the same time you must know what your enemy is about. For that purpose it is now the custom to push bodies of cavalry to very great distances in the front or on the flanks of armies moving in the field, so as to form a veil to the army behind them. In the performance of this duty, circumstances frequently arise in which they not only succeed in detecting what the enemy is doing, but if they have a firearm, in the use of which they can employ a portion of their force, they can prevent the enemy re-taking the points which they have seized upon. In fact, they can *hold*



important points of advantage which by their mobility they have gained, and for that purpose the greater part of all cavalry should in the present day be armed with a firearm of sufficiently long range to compete with infantry up to a certain distance; in fact, up to the distance to which most sensible men think infantry fire ought to be confined. In armies where you have a very large force of cavalry, and can afford to be extravagant, you may indulge in such expensive luxuries as cuirassiers and lancers, but in small armies the greater portion (if not the whole) of the cavalry ought to be armed with a carbine. I was not aware until Major Boulderson told us just now in his lecture, that the whole of the Prussian lancers were armed with a carbine, and I am very much surprised to hear it. I gave up my post in Berlin in April of last year, and I really since have failed to follow the course of the armament of the lancer; I can only say what was the case while I was in the country. The question was under discussion for two years, and every possible way of carrying the carbine and lance was tried. The Emperor was extremely opposed to it, so was one of the smartest of their Generals, Field-Marshal Von Manteuffel; but it was agreed that for purposes on which lancers might be employed, as well as other cavalry, it was necessary that they should be able to hold what they got, or to prevent themselves being driven off by small and indifferent bodies of infantry. In the first place they armed them with the French Chassepot cut short. The lancers in the Prussian Army knew so well the value of the possession of a good firearm that they used to collect the Chassepots off the field of battle, substitute them for their own carbines, and carry these long rifles slung across their backs.<sup>1</sup> They tried also carrying the carbine slung over the left shoulder; that was also condemned, and for good reason. I have been for the last six or eight years passing the whole of my few holidays in deer-stalking, and I unhesitatingly condemn the practice of carrying the carbine, or whatever it may be, in that manner; it is a most disagreeable and uncomfortable way, not to speak of the horrible manner in which it spoils your clothes. I found that if I strapped it so tight that it did not knock about when I trotted, it exerted a most painful pressure on the chest. If I slung it loosely, I came home black and blue from the trigger-guard striking on the hip. The Prussians, therefore, returned to the old mode of carrying the carbine, like ourselves, on the right side. Major Boulderson mentioned the difficulty of dismounting. The whole thing was tried at a parade before the Emperor in the spring of 1876. The surcingle was loosened, the lance left in the bucket on the off side, the sword placed against the saddle, hilt to the front, on the near side, in the same way as the Spahis carried their swords, and the surcingle was then buckled over both lance and sword. The horses were taken by the centre men of threes, the rights and lefts dismounting for foot service; but I had no idea until I heard it from Major Boulderson to-day that they had attempted to give the carbine to more than thirty-two men per squadron. No doubt the lance is a most formidable weapon, but the question that arises in my mind is whether, with the extremely small force of cavalry that we have, we can be so extravagant as to have any large force of lancers. I do not think we could sacrifice the whole of the front ranks of our cavalry by giving them the lance; we should have too many lancers in proportion to the number of men who had the carbine. As to mounted infantry, of which we have heard, in my opinion they are neither one thing nor the other; they are not good cavalry, and therefore are unable to undertake independent duties as bodies of cavalry, and they certainly to a great extent would be spoiled as infantry. I do not think, therefore, in a small army like ours that it is a force which is necessary for us to have. You may improvise them, certainly, as the Germans did on certain occasions, by collecting carts and sending infantry in those carts along with the cavalry. In that way they are very useful; but the greater part of the successful expeditions, when great hurt was caused to the enemy by destroying railways, blowing up bridges, getting possession of stores and cutting off convoys, was performed during the war of 1871 solely by cavalry who, being armed with good carbines, and being also good cavalry, accustomed to ride long distances, accustomed to look after their horses, and to know what to do through-

<sup>1</sup> After the war various modes of carrying the carbine were tried. They first carried the carbine perpendicularly on the off side. This was rejected because of inconvenience when going over rough ground.—B. W.



out the whole business, were certainly more efficient than any infantry temporarily detached for the same service could have been. In Germany a most careful system is now carried out by which the non-commissioned officers and a certain number of men in every regiment of cavalry are specially instructed in the use of instruments for destroying railways. I applied to be allowed to see the instructions, but I was distinctly and positively refused by the War Minister. I am much obliged to you for listening to me, but I really felt almost ashamed, knowing the great pains that Major Boulderson has taken, that no cavalry soldier should say a few words in praise of his lecture.

Colonel Lord ELCHO, M.P. : I have waited in hopes that some cavalry Officer would have spoken on what I venture to think is one of the most important questions which could be brought before this Institution, namely, how cavalry are to be armed. As it happens, reference has been made to Colonel Evelyn Wood's lecture ; it has been largely quoted from by Major Boulderson, and it happens that I was in the chair on that occasion, the late Sir Hope Grant being present. I gather from Major Boulderson's lecture that he is in favour of arming cavalry in different ways, according to the position of the men in the ranks ; that he would arm the front rank with lance, sword, and pistol, and the rear rank with carbine and sword. I was under the impression that everything was tending, both in cavalry and infantry, to the interchangeableness of ranks ; that in the infantry, by turning to the "right about," the front rank should become the rear rank, and the rear rank the front rank, and that the same sensible change was going on also in the cavalry. There must be many occasions when it is desirable that a change of front should be made, and I was under the impression that any idea of keeping front and rear rank distinct and arming them differently, as proposed by Major Boulderson, belonged to a time gone by in military tactics. What was the origin of front and rear rank ? Simply that as a man tries to show his best teeth, and if he has decayed teeth he would rather not show them, the picked men were put in the front rank and the scrubby men in the rear, and in those days of pipeclay you tried always to keep your best men in front. I, therefore, venture to think I am borne out in stating that the tendency of the age is to get rid of these distinctions of front and rear rank, and that therefore an argument based on the assumption of the continuance of the old system falls to the ground. The question rather is, what the whole of your cavalry should be armed with ? As to lance, sword, or pistol, not being a cavalry Officer, and only a civilian soldier, it is not for me to give an opinion, and if I speak at all on military matters I do so on the ground that in military matters ordinary common sense comes into play. After all, soldiers are nothing more than hunters of men, and principles which apply to the ordinary tactics of hunting beasts apply equally to the tactics of hunting men ; therefore I say any man who hunts beasts where he has to bring his common sense to bear is justified in giving an opinion on common sense matters with reference to the mode of hunting men. Let us assume that the whole of your cavalry is to be armed with the same weapons ; I mean to say that there is no distinction between front and rear rank. I do not say whether it should be armed with lance or sword, or with both ; but I certainly think we are greatly indebted to General Walker for giving us the weight of his opinion and experience, not only in the English Army, but with foreign armies, he having occupied the responsible position of military attaché at Berlin, and the result of his experience is, not only that we should give a firearm to every cavalry soldier, but that it should be of the longest possible range, and he sets his face dead against what Colonel Evelyn Wood proposed, viz., the establishment of corps of mounted infantry. It was perhaps rather rude, but no sooner had Colonel Evelyn Wood finished his lecture than a great many of those present fell foul of him, objecting to the view he took, and no one more so than that distinguished cavalry Officer Sir Hope Grant ; he was the first to denounce the idea of these corps which Colonel Evelyn Wood was in favour of being considered as foot-soldiers put upon horseback only. I think he said "men taken out of the ranks and taught to ride." Sir Hope Grant's view was as, I think, would be that of most of us, that a force of that description, who are to be the *éclaireurs* of the Army, should be mounted on the best horses and armed with the best weapons. His Royal Highness the President, at the meeting of the National Rifle Association last year, said it was as essential that a cavalry soldier should shoot well as it was that an infantry soldier should do so.

Now shooting well not only means shooting with accuracy at a hundred yards, but that he should shoot as well at long distances as an infantry soldier. And that brings us to the question, assuming that it is desirable that a cavalry soldier should carry a firearm, whether it should be a carbine or a more powerful description of weapon. I think it is a matter of plain common sense, assuming that they are all to have firearms, that if they can, with convenience to man and beast, carry an arm which will shoot as well as the arm which the infantry carry, they will be more effective in the field thus armed than if—because hitherto a carbine has been commonly used by the cavalry soldier—he is still to carry that arm, with which he is powerless when opposed to an infantry soldier beyond a certain range. The Secretary of State for War the other day said the Martini-Henry carbine, which the cavalry have now got, was more accurate at a thousand yards than the Martini-Henry rifle. Now any man who knows anything about shooting knows that this is manifestly impossible. On my way here I went into Mr. Wilkinson's, the gunmaker's, and measured the respective lengths of the Martini-Henry carbine and rifle. One is eleven inches longer than the other, and any man who knows anything about shooting must know that the man who is armed with the carbine which is eleven inches shorter than the rifle, if he is to meet a man armed with that rifle which is a short weapon, must in the long run either be killed or run away. That is absolutely certain as regards the result of the shooting qualities of those two weapons. Therefore, common sense points to dropping the word "carbine," and that if you are to give a firearm to your cavalry soldiers that it should be the best they can conveniently carry. Then comes this question of carrying. The Secretary of State for War also said as a reason for adopting the Martini-Henry carbine that in the recent war either the Russians or the Turks—probably the Russians—were asking for a shorter weapon on account of the inconvenience of the longer one. That entirely depends upon the method of carrying. There was a model cavalry corps, unfortunately now extinct, viz., the Hants Mounted Rifle Volunteers, and on the occasion of Colonel Evelyn Wood's lecture we had here its colonel, Colonel Bower, with the equipment of the corps. He put the saddle on to a block, got on it, showed how the long rifle could be carried with the utmost convenience in the Namaqua bucket; and I can myself speak practically on this point, because I have tried it by going over fences and through spinnies, and from the way the rifle is fixed to the saddle it is no inconvenience to the rider and offers no obstruction to the free use of the sword arm. This is probably the simplest and best possible way of carrying a rifle. It is not an invention of Colonel Bower's. Colonel Bower, when employed by the East India Company at the Cape to buy horses, made acquaintance with the Namaqua bucket, as used by the Kaffirs to carry their guns on horseback, and there can be no doubt that they did so in the way most convenient to themselves. Nothing can be more intolerable, as General Walker has told us, than anybody attempting to attach the gun to himself. I have been a deerstalker all my life, and the one thing one tried to do was to put the weight of the gun on the horse, and not on one's self. That is what is done by the Namaqua bucket in the most convenient manner, and when the cavalry soldier wants to use his rifle, he can get it at once. I happened to succeed Lord Spencer on the Small Arms Committee, the result of which was the selection of a long-range rifle, handy and light, which would do for all branches of the Service. Up to that time there had been one kind of rifle for the infantry, another for rifle regiments, a carbine for the engineers, another for the artillery, besides a rifle for the Navy. We thought as practical men it would be an immense thing for the Service, for economy, supply of ammunition, and other reasons if, instead of having all these various arms, we could decide upon one suitable for all purposes, and this the Committee succeeded in doing. I was, therefore, very sorry when I saw that the intention of the Committee had been departed from, and that we were going to have for the cavalry a carbine instead of the Martini-Henry rifle, which the Committee intended to answer all purposes. In conclusion, I would only say that I know that there are strong advocates in the cavalry for the carbine as against the rifle; that they are afraid of being made mounted infantry. It is not a question of their being mounted infantry, but of making them the most efficient cavalry you can for all the purposes for which cavalry are likely to be used, and I venture to think the long rifle is more useful, taking the whole extent and work of a campaign, than a carbine that will carry much shorter

distances. We are now all armed with breech-loaders. This same question as between the infantry rifle and carbine really is in principle a renewal of the old argument we used to have in this room from time to time upon the question of breech- *versus* muzzle-loaders. I heard His Royal Highness the President, when in the chair at a meeting of our National Rifle Association, and when we were urging the adoption of the breech-loader for the Army, say: "Be very cautious how you adopt the breech-loader for the Army, because the ammunition will be so rapidly expended that it will be difficult to keep up the supply." There was no doubt a prejudice against it for those reasons. Sadowa came and swept the whole of that away, and I suppose there is not a man in this kingdom who would wish to take out a regiment armed with muzzle-loaders against a regiment with breech-loaders. At that time when I found any man who was hesitating and anxious to retain the muzzle-loader, I used to put this question to him: "Suppose you are going out with an army of 20,000 or 50,000 men; you say you are in favour of the muzzle-loader; you know you are going to be opposed to an army equal to your own in all other respects, but which will be armed with the breech-loader; which would you take?" The answer invariably was: "Oh! under those circumstances, I should choose the breech-loader." I use that as an illustration of this present question as between a long and short range arm for cavalry. If any gentleman is in favour of the carbine for cavalry, instead of the infantry rifle which the Committee recommended, I would put the same question to him. He knows he has cavalry to command, and that he will be opposed by cavalry equal to his own in every respect, as regards horses, as regards the *morale* of the men, equal in number, and armed with a long range rifle. I would ask any man in his sober senses if he had to meet cavalry so armed, would he choose the long rifle or carbine for his own men? There can be but one answer, and I venture with all due respect to say, talking as a civilian, and I hope trying to talk common sense upon a common sense matter, *cadet questio*, when it is put in that way to gentlemen who argue in favour of short range against long range arms. I, therefore, hope that we may see our cavalry carrying rifles, but still essentially cavalry, doing all that cavalry are able to do now, and a good deal more. It would require this, however, that their clothes should be a good deal looser, with trousers not so tight as they now are, because I often see cavalry soldiers so attired that unless their trousers are made of leather or elastic, I do not see how possibly they can get on or off their horses. That is the only other practical change that would be necessary, but I hope that these changes will be brought about; and I trust that Major Boulderson will forgive a civilian for venturing to express opinions which materially differ from those he has expounded. At the same time I would offer my thanks as a member of this Institution to him for having brought this subject before us, for I believe few things more important can be discussed in this room.

Lieut. GRAVES, 20th Hussars: Lord Elcho has differed rather with Major Boulderson as regards the arming of the rear rank differently from the front rank, upon the principle that the rear rank ought to be able to do exactly what the front rank does when we go "fours about;" but I think we move now in the cavalry more by the "wheel about" of troops than by getting the rear rank in front, and I think with very great advantage. I quite agree with Major Boulderson in saying the rear rank only should be armed with carbines, for the simple reason that scarcely if ever does a regiment use more than one-third of its firearms at any one time. There is another very strong reason why the rear rank only should be armed with the carbine; it is this: when we come to a point which we want to hold, and the order is given, "odd numbers," or "even numbers with carbines, dismount!" it should not be left to chance whether the odd numbers or even numbers may or may not be the worst shots in the whole squadron; the carbines ought to be in the hands of the best shots, they ought to be picked men, and ought to be drilled and taught that it is upon their carbines that the retention of the point depends more particularly. Their place then ought to be in the rear rank. If the rear rank were armed thus with carbines we should have a sufficient number of carbines continuously all through the whole Service. Speaking of revolvers, the gallant lecturer says: "Just fancy at the moment of a *mêlée* in which lancers used revolvers, how many shots would actually hit the men fired at." This is not a matter of theory; the experience of the American War gives us facts upon which we can go, and I hold in my hand one



or two cases which supply a telling answer to the lecturer's question. In November, 1864, a fight took place in Virginia between a squadron of Federal cavalry armed with the sabre, and a squadron of Mosby's armed with the revolver; the loss of the latter was one man killed and several wounded, and the loss of the Federals was 24 men killed, 12 wounded, and 62 prisoners; 36 killed and wounded out of 100. I think that speaks for itself. In a similar fight the sabres lost 26 killed and wounded, 54 prisoners and 80 horses, the Confederates, who were armed with the revolver, lost not a single man. However, the Commander-in-Chief has decided to give revolvers to all the details of regiments of cavalry upon the war strength. I believe that is a step in the right direction which is supported by the facts of war. This revolver carries the Henry-Martini bullet with a 23-grain charge of powder, and is a very useful weapon with the exception of the method of unloading the empty cartridges. It is very cumbersome in that way. On the other hand, I would ask, how many would be killed in a *mêlée* where the sabre or lance is used? In 1799, at Egmont-op-Zee, two troops of English cavalry charged 500 French and drove them off; the French rallied and charged again; however, the result of both *mêlées* was the loss on the English side of 3 killed and 9 wounded. The fact is our sabres do not cut. I forget who it was said that in the charge of the Guards at Waterloo, it was like so many hundred hammers coming down upon as many smiths' anvils; as a proof that our sabres as a rule do not cut. In the whole of the Franco-German war out of 65,000 killed on the German side, only 218 were killed and wounded with the sabre and clubbed musket and lance. The killed by the sabre in the whole six months' war, including Woerth, Vionville, and Sedan, together with the battles on the Loire and the northern provinces, as well as all the outpost service, extending over nearly half of France, was six, notwithstanding that there were 40,000 cavalry engaged. Therefore, if we are going to do any work in the shape of cavalry *versus* cavalry in active service, I think the revolver is the weapon for the front rank, and I also believe it is quite sufficient to arm the rear rank only with carbines. I quite agree with Lord Elcho that it ought to be a weapon of the longest possible range which can be carried. With regard to mounted infantry with rifles, that also is not a question of theory, but of facts. It is not a question what we think they might do, whether they might make bad cavalry and worse infantry, but what they have done when they have been tried. In the American war, General Sheridan had 10,000 of this arm under his command, and, as Sir Garnet Wolseley said, when I read a paper here last January, they were bad cavalry; however, they were able to take up and hold strategical points in such a way as to do great service. The use Sheridan made of them when dealing with General Lee's rear guard on the way to Lynchburg is very striking, but then they were thoroughly instructed in the use of their arms, and they were the means of 6,000 prisoners being taken, together with 16 guns and 400 waggons. He was pursuing and came in contact with the rear guard of his opponent. He engaged them with a small force and sent about 8,000 of his mounted infantry round; they went in rear of the rear guard, cut them off from the main body, and took up a position upon a river under very favourable circumstances, and the result was that the whole lot were taken prisoners or killed. This was done by bad cavalry and only middling infantry. I was told at a brigade dépôt the other day that the men coming for enlistment were very small. Those are the men we want for that particular work. Our hussars scale an average of 19 stone each; now I maintain that that is not the weight for an hussar or for mounted rifles, and for that particular arm, mounted infantry. They should be the lightest men obtainable, and I dare say many infantry Colonels would be glad to get rid of twenty good charactered men of small size and light weight. I see from the Chancellor of the Exchequer's statement last night that he has spent 240,000*l.* in horses. Now supposing we have no war, what will be done with those horses? I believe the Government have a very good opportunity of forming three or four or five fresh corps either of cavalry or mounted rifles, and there are many Officers who would be very glad to volunteer for service in them. It would not occasion any very great expense of men to existing battalions, and I believe would be a very great help. I take it, as I look back upon history and mark the failures of great men and great armies through want of cavalry, that that is the point where we shall fail. We have a very small force of cavalry; we cannot afford to turn it into infantry; we want a



force that will do the work of infantry and hold places which we cannot afford to give cavalry to.

I think the Council of this Institution may be congratulated upon obtaining such a valuable addition to their Journal as the lecture to which we have listened.

*Note.*—It may be well to remark that "mixed armament" for cavalry is supported by such men as Jomini, Marmont, De Brac, and Napoleon, as well as such writers as Hozier, Trower, Dennison, and Elliott, to say nothing of the telling results of modern warfare, and the action of several of the Powers of Europe.

General Sir WM. CODRINGTON, G.C.B.: There is one important point to know with regard to this armament of cavalry, whether they are to be dismounted to use these rifles that Lord Elcho speaks of, or whether they are to use them on their horses.

Lord ELCHO: They never fire mounted.

Sir WM. CODRINGTON: Then I understand that they are to be dismounted and will act as infantry: they must have some one to hold their horses.

Major BOULDERSON: It is only in very exceptional cases. The tactics remain exactly as they were, only that they are supposed to dismount to use their firearms on special occasions.

Sir WM. CODRINGTON: Is the man who dismounts to hold his own horse?

Major BOULDERSON: No.

Sir WM. CODRINGTON: Then there would be two-thirds of the horses held by the others.

General BEAUCHAMP WALKER: They dismount two-thirds in the German service.

Sir WM. CODRINGTON: It is essential to know whether the cavalry man is to fire his rifle from his horse, which I understand is entirely given up.

General BEAUCHAMP WALKER: Forbidden on pain of death in our service.

Sir WM. CODRINGTON: Then the horse must be held by another man; that is what I wanted to know.

Major BOULDERSON: There are just one or two small points I wanted to refer to in answer to those gentlemen who have spoken; and first of all, referring to what General Walker has said, I merely quoted Colonel Evelyn Wood's lecture to show it is a matter of history that when cavalry are given firearms they invariably do deteriorate. That was almost my sole object in quoting that lecture, but it also shows that their tactics invariably alter when you alter their armament. Then, as to the mounted infantry, I do not advocate mounted infantry, but something should be done to prevent the cavalry deteriorating, which I maintain will necessarily follow by giving to it these firearms throughout regiments, and forcing it to use those tactics. History proves it so. Therefore, however bad these corps of mounted infantry may be, still they are of some value, and if they are used in their proper place to support the cavalry, they may be made considerable use of. They may be bad in some ways, but still it will save to a very great extent the cavalry from deterioration by being used as infantry.<sup>1</sup> My chief object in proposing mounted infantry was because we cannot supply three army corps with cavalry. We are talking of sending three corps out in case of war, and I say you have not sufficient cavalry for the third corps. I showed you a way in which you could secure a sort of cavalry ready to act with the divisions in at most six months, and in no other way can you obtain the cavalry in that time. That this can be done is proved by the case of the Peshawur Light Horse, which I have quoted in my paper.

The CHAIRMAN: I have very few words to say. It is very evident from the course taken at this meeting that there are a great variety of opinions. Some Officers advocate the use of cavalry exclusively as cavalry; others say that cavalry can be made available for infantry purposes, and others that there should be mounted infantry. First, as to the firearms. I have not the slightest doubt in my own mind that every cavalry soldier should be armed with a firearm. I have long held that the cavalry man with either lance or sword in his hand may be available for a certain kind of service, but as for general service he is useless. I am quite

<sup>1</sup> By arming the rear rank only with firearms, you may keep the old cavalry spirit alive, and at the same time satisfy the modern requirements.—S. B.

convinced of what Lord Elcho says, although the only point I have any doubt about is with reference to using the long rifle, whether it can be so slung on the saddle that it is not an inconvenience to the man mounting and dismounting, because even with the carbine as slung in the bucket now it requires a man to be tolerably active, especially with those very tight trousers which have been mentioned, I can admit it is a very difficult thing to get a man into the saddle, but at the same time if a long rifle can be carried as well as a short one, there is no doubt the long one is infinitely preferable. I do not at all like the idea of having the front rank armed with one weapon and the rear rank armed with another. I think those days are entirely gone by. If you have your front rank armed with one, and your rear rank armed with another, it may do very well, supposing all your men are on parade, but it may happen in war that your front rank men are half killed, or if you want your carbines, and those men are killed, you lose the use of them; whereas if you have them all armed in the same way the squadron leader has only to say, "I want so many 'men to go to the front,'" and those men are available for the purpose whatever weapons they have to use. Of course, my friend Major Boulderson, being a lancer, thinks it high treason for me to oppose him very vehemently, but I have also come to the conclusion, that really in our Army, lancers should be done away with. The lance is a very good weapon, and there may be cases such as those referred to in India where no doubt it is most valuable, and there are a great many cases where the lance is a very formidable weapon. But then we must look at the relative value between the lance and the sword. If I recollect aright there were two instances in the Austro-Prussian war. On one occasion the Austrian lancers were met by the Prussian hussars, and the Prussian hussars rode them down. On another occasion it was *vice versa*, the Prussians had lancers, met the Austrian's hussars, and the Prussian lancers rode the Austrian hussars down; proving that it is not altogether a matter of weapons but of men.

General WALKER: And place.

The CHAIRMAN: Exactly; so that with our small force of cavalry I cannot help thinking a lancer is an expensive arm for us to have. As it is at present the lancer has to use his lance, he has to be taught the use of his sword, and also the use of his rifle. You are asking a man to attain almost perfection in the use of three weapons, where, as every one knows, it requires a very considerable period of service to make a man able to use his lance, and when he uses his lance he has to be a swordsman, and on other occasions to be a good rifleman. It is asking a man to do more than the great majority of men are able to do, and, therefore, I am almost afraid the lancer would be jack of all trades and master of none. With reference to the mounted infantry there is no question, if we could have them, there are many occasions where they would be very good, but I am not quite certain in my own mind whether, if the money is to be spent and the men to be obtained, it would not be a far greater advantage to our Army to have them as cavalry and not as mounted infantry. I am very doubtful upon that fact. If the money is to be voted I am all for having more cavalry. There are such instances as those that Lieutenant Graves mentioned, in which no doubt they were very valuable, and did great service in the American war; but there is a feature that has come out very strongly in all these last wars, and that is the use of the spade for an army in position, and no doubt when an army takes up a position, entrenches itself, and occupies that position, mounted infantry are not of very much use. Mounted infantry may be useful for a raid, or to charge an enemy's position on different occasions, but in line of battle, where you have 200,000 and 300,000 in the field, a small portion of mounted infantry will be of very little use, more especially where you have entrenchments which no mounted infantry could come anywhere near. Those are all the observations I have to make, and I will, on your behalf, thank Major Boulderson for his interesting lecture.

Lord ELCHO: May I ask General Walker a question? I have heard that the Russians are now armed with lances.

General WALKER: They have been for many years.

The CHAIRMAN: General Walker was aide-de-camp to Lord Lucan in the Crimea; perhaps he can tell us whether at that charge of heavy cavalry, when Sir John Scarlett and our heavy brigade went into that mass of Russians as a hot knife does

into butter, most of the Russian cavalry were armed in regiments or in ranks with lances.

General WALKER: I know they had lancers, because I was employed reconnoitring, and I believe I was the first person who ever counted the Russian cavalry; they had sixteen squadrons armed in a certain way.

Lieutenant GRAVES: What pace were the Russians moving at?

General HODGE: When the heavy cavalry charged in, the Cossacks enveloped the regiments that went in. It so happened my regiment was in reserve, and we came in almost to the rear.

General WALKER: My impression from memory is—it is difficult to answer these questions on the spur of the moment—that the sixteen squadrons of regular cavalry were all hussars, and there were about 500 Cossacks who carried the lance; but I think the regiments of regular Russian cavalry which I saw day after day, and got pretty close to, were all hussars, to the best of my recollection. If it is not too late I should like to make one short remark, in answer to your own very apt illustration of the campaign of 1860, where the Austrians and Prussians came out together. I do not think it matters when you come to heavy men whether they are lancers or swordsmen, because the men who go the greatest pace, and cut in with the greatest determination, will probably ride the others down. I have asked General Hodge's permission to advert to one of the most notorious instances in war where lancers were supposed to have gained the advantage. It was the day when General Hodge's father was killed. The story is supposed always to prove the great superiority which the lancers exercised over hussars; I heard the whole story from an eye-witness. It seems that a body of French lancers debouching from Genappe stuck themselves between two walls. The 7th Hussars charged them twice, and were received on the points of the lances, and spitted like fowls; but I believe our Life Guards rode them down afterwards, when they were foolish enough to come out from between the walls, but not till then. It was not until the lancers came into the open, and gave the Guards the opportunity of charging on equal terms that they were ridden down. While they stuck themselves between the walls and formed themselves into the phalanx they obtained the great success which they did obtain over the 7th Hussars. It was somewhat similar in the case of a very fierce fight that took place between Prussian dragoons and Austrian lancers. The Austrians had a great advantage as long as they remained in the narrow streets, but the dragoons being somewhat worsted in the commencement of the fight retreated; the lancers were foolish enough to come out from their point of vantage, and then the dragoons rode them down. Therefore it is very hard to say in a downright stand-up fight which has the best of it. Lieutenant Graves made a slight mistake in speaking about the Prussian dragoons being heavier men than the hussars. The Prussian dragoons and the hussars are the same sized men.

Lieutenant GRAVES: I referred to our hussars generally.

General WALKER: If it is any consolation to gentlemen here, I may state that the Prussian dragoons and the hussars weigh about 1 lb. to  $1\frac{3}{4}$  lbs. more or less than ours do on an average; I really do not know which it is. There is not a single difference of weight in the equipment of the two armies; our light cavalry and theirs are as nearly as possible of the same weight, for the dragoons are light cavalry.

# NAVAL ESSAYS

## HONOURABLY MENTIONED.

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SUBJECT :

GREAT BRITAIN'S MARITIME POWER : HOW BEST  
DEVELOPED AS REGARDS—

1. FIGHTING SHIPS.
2. PROTECTION OF COMMERCE.
3. NAVAL VOLUNTEER OR SUPPLEMENTAL FORCE.
4. COLONIAL AND HOME DEFENCE ; THE CLASSES, ARMAMENT, AND DESCRIPTION OF THE VESSELS NEEDED ; AND THE ORGANIZATION REQUIRED TO SECURE A POWERFUL AND ECONOMIC IMPERIAL NAVAL FORCE.





# GREAT BRITAIN'S MARITIME POWER, HOW BEST DEVELOPED, &c.

By Lieut.-Commander JAMES B. HAYE, R.N.  
(China Station.)

## "ORGANIZATION AND DECENTRALIZATION."<sup>1</sup>

### I.—*Fighting Ships.*

IN considering the development of our maritime strength as regards fighting ships—

It may be assumed that it is the province of the naval officer to represent to the naval architect and engineer the qualities that are desirable for the fighting ships, designed to perform each particular class of service, and to state the relative values and prominence to be given to the different qualifications, as draught of water, speed, coal-capacity, &c., to enable these vessels to perform the particular duties allotted to them. The naval architect and engineer will then have to calculate how far it is possible to combine these qualities, and what modifications are necessary or desirable. It is, therefore, idle to enter into questions of expense and construction without an intimate knowledge of the subject.

It is proposed to arrange the present ships of the Navy in classes, according to the work required of them, with remarks and comparisons, and to consider some of the questions of armament, armour, &c., which bear on the subject.

Naval architects might, with advantage, serve a time in the fleet.

#### Class A.

Would consist of the exceptional and experimental ships which it will be necessary to build, in order to keep pace with foreign nations in the rapid advance of modern invention and the development of naval warfare, especially as regards the Torpedo and the Ram.

H.M.S. "Inflexible," for instance.

The number of these vessels will necessarily be limited, but we should always have enough of them to hold our own at home and in the Mediterranean. Ships, of this class especially, will require

<sup>1</sup> The writer regrets that want of time prevents him completing his programme, or sending a fair copy of his essay.

auxiliaries ; in fact large ironclads will probably in future become the centre of a small group or squadron.

In this class would be also included—

The Ram, without gun power, and with or without

The Torpedo, or submarine gun or rocket ;

The very fast Torpedo Boat for harbour and coast defence ;

And the Circular Ship, or some modification of it.

The value of these will have to be decided by experiment.

Experiments are also required to ascertain the best method of strengthening the bottoms of ships to resist the effect of torpedoes. Many ways have been proposed :—Sheathing all the ironclads with wood ; increasing the number of cells and filling them with cork ; placing armour between two layers of wood-planking, or using inside-armour in the wake of boilers and engines ; but no definite conclusion as to the value of these plans can be arrived at until they are tried.

The penetration of steel projectiles at various angles, the effect of bursting charges of gun-cotton, and the resistance of steel and chilled armour, especially when placed as turtle-backs to torpedo vessels and rams, will probably greatly influence future naval construction.

#### Class B.

Ironclads of light draught of water for the defence of our rivers, harbours, and coasts, and for offensive operations in shallow water.

We have already two typical vessels which seem nearly perfect for this duty, viz., the "Cyclops" Turret Ship, and the "Glatton" Turret and Ram.

		"Cyclops."			"Glatton."		
Tonnage ..	..	3,430 (2,107)	..	..	4,912 (2,709).		
Horse Power ..	..	1,660 (250)	..	..	2,868 (500).		
Armour ..	..	8-inch	..	..	12-inch.		
Guns ..	..	Four 18-ton	..	..	Two 25-ton.		
Speed ..	..	10 knots	..	..	12 knots.		
Coal Storage ..	..	120 tons	..	..	240 tons.		
Draught ..	..	Aft. 15½ ft., Forward 15½ ft.	..	..	Aft. 22 ft., Forward 20 ft.		
Crew ..	..	150 men	..	..	200.		

Both these vessels, however, have double screws, very liable to be fouled by entanglements.

It is a question how much their draught will be increased when the superstructures, mentioned by Mr. Barnaby as necessary to make them sea-worthy, are added.

The "Cyclops" might, perhaps, be more efficient if she had a ram-bow, and carried one 35-ton gun in each turret, instead of two 18-ton guns ; and the "Glatton" by carrying two 35-ton guns, instead of two 25-ton guns. Both would probably be improved if their motive power were hydraulic, and they were double rams.

The "Cyclops" could pass in-shore along the coast from Dover to Yarmouth, and enter the Medway or Harwich Harbour at any time of

tide, and in any but exceptionally rough weather, and this should be the standard for the subdivision of Class B.

The test of sea-worthiness for the "Glatton" and her subdivision should be ability to keep the sea during a North Sea winter gale; she would be suitable for the Home, North Sea, Channel, and Irish Channel Squadrons.

All this class should have their bottoms strengthened structurally, to enable them to resist the effect of torpedoes, and of taking the ground.

They should have steam capstans aft as well as forward, and stern anchors, bitts, &c., as well as bowers.

If, as Captain Scott suggests, the capstan engines can be utilised for working auxiliary hydraulic steering jets, it would be a great assistance to them in narrow waters.

These vessels, in common with all turret ships, have the defect of being unable to carry small guns on their upper deck for defence against torpedo-boats, without confining the arc of training of their turret guns, unless it may be possible to mount such guns on the superstructure.

Although it is advocated by many that our coast may be defended more economically by swift torpedo-boats and floating gun-carriages, which will undoubtedly be required in great numbers, it must be remembered that these gun and torpedo-boats can be destroyed by very light guns, and that for efficient coast defence (or attack) we require some heavy guns, mounted in armoured ships.

In fact, to operate efficiently, especially in narrow waters, a mixed force is required, each type being necessary and auxiliary to the other.

It may also be necessary to build floating forts, with or without steam power, according to the locality for which they are designed.

### Class C.

#### *Ironclad Line-of-Battle Ships without Sail power.*

The "Thunderer," "Devastation," &c., represent this class.

Doubts have been entertained as to whether these vessels possess a sufficient reserve of floating power and stability, in case of serious injury in action, when light, and when short of coal and stores.

Should, however, they be secure in this respect, they may be considered as one of the best types of a first-class fighting ship for combined action.

Their guns are quite heavy enough for any practical purpose.

The absence of heavy masts and rigging enables them to steam well head to wind; and, while they have all the advantages of twin screws, the risk of fouling them is reduced to a minimum.

Their most valuable quality is decidedly their great coal-carrying and steaming power.

Their defects consist of the inability to carry a sufficient number of small Gatling and other guns for defence against torpedo attacks without masking their turret guns; want of distribution of fire if attacked by two or more smaller vessels; and want of power to depress their



guns sufficiently ; the difficulty of carrying a sufficient number of steam launches of a suitable size for protecting them against torpedoes. There will always be great difficulty in lowering and hoisting such steamboats at sea.

Vessels of this class should never cruise without other auxiliary vessels to defend their weak points.

The turret system evidently loses its value wherever the guns are masked by masts, rigging, forecastles, or other obstructions.

#### Class D.

##### *Ironclad Line-of-Battle Ships having Sail power.*

No ironclad can be considered in the 1st Class whose main armament does not consist of at least 10 guns. In these vessels a single lifting-screw will be in great danger of fouling, but the screw-well will afford a fair chance of clearing it in a moderate time. A single non-lifting screw will be more difficult to clear. The twin-screws will not only be infinitely more liable to foul, but will be almost impossible to clear until divers can work in smooth water. The double-screw vessels, however, make a good fight when only one screw is foul. Many naval officers are of opinion that a foul screw will be the greatest danger to which a heavily rigged vessel will be exposed in action.

To meet this probability every ship should be ready to drop her torpedo-boats and nets, and although she may be rammed, the vessel that rams her should also be destroyed by the boats, or by spar-torpedoes. The Whitehead, however, would be the weapon probably used on this occasion. An hydraulic jet for turning the ship, worked by capstan or fire-engine, would be useful to a disabled vessel. These dangers may be removed with the masts and rigging on those stations where coal can be obtained, as the Home, Channel, and Mediterranean. We cannot afford to throw away a single chance in our favour.

Of all the types of masted ships proposed, or actually built, the "Victory," as designed by Captain Scott, R.N., seems to be the one which combines the greatest number of advantages, both for 1st and 2nd Class ironclads, and even for the belted cruiser.

The "Victory" certainly gives the best distribution of fire, for fleet manœuvring, and for single action. The extent of armour is reduced as much as possible, while protecting the most vital parts.

The upper deck is clear for small guns, Gatlings, or rifle fire.

The curved iron deck affords additional protection to boilers and magazines.

Few of our ironclads carry the 10-inch gun ; of those that do so, the "Alexandra," "Temeraire," and "Hercules," have the embrasure ports, or, as some call them, shell-traps. The danger of the battery being raked through these ports is recognised in the two first, by placing an armoured bulk-head to prevent it.

The two foremost guns of these ships, although well arranged for engaging vessels of less speed, would place them at a disadvantage in action with a "Victory" of equal speed and manœuvring power ; even should the "Temeraire" gain a favourable position astern of

"Victory," the sides of the embrasure ports would guide the shell into her battery. A central longitudinal bulk-head would be desirable to divide the foremost battery, and still further it would localise the effect of the bursting shell, but it would also intensify it.

The "Iron Duke" class has only 12-ton guns so placed, that out of 5 on each broadside, she would seldom be able to bring more than 4 to bear on a vessel manœuvring for the purpose of avoiding the fifth.

This class would be improved by having a clear upper deck, with an 18-ton gun mounted *en barbette*, at the bow and stern, the remainder of upper deck being used for mounting small guns, and having a banquette for rifle fire.

### Class E.

#### *Cruisers.*

This class embraces all vessels between the "Northampton" or "Inconstant," and the "Flamingo" or "Lily."

All cruisers should have their bows strengthened and shaped for ramming; and, where the size permits, should be fitted to discharge the Whitehead, or some similar torpedo, right ahead and from either beam.

Sail power should be dispensed with as far as possible.

In those ships intended for stations where sail power is necessary, the turbine should supersede the screw.

Protected cruisers will certainly be necessary in the North Atlantic and Mediterranean, and perhaps one or two will be required for each other station.

The protected cruiser should carry a few heavy guns amidships on the main deck, behind armour of at least sufficient thickness to keep out common shell, with heavy bursting charges, the remainder of the armour being placed so as to defend the vital parts alone, viz., steering gear, engines, crowns, and up-takes of the boilers, magazines, and shell rooms. The water line should only be protected in the wake of these vital parts, the floating power of the ship being attained, as far as possible, by multiplying the water-tight compartments, every advantage being taken of the best material, to ensure strength combined with lightness; perhaps the chilled armour, mentioned by Commander H. H. Grenfell, will take a prominent place in future ships.

The steering gear might be protected by an armoured compartment or trunk, the wheel ropes being carried forward through water-tight tubes, placed so low in the ship, as to avoid the necessity for armour at the water-line, between the main battery and the trunk.

Captain Scott's arrangement of armour in the "Victory" seems to afford the best protection with the least weight of material. The steering gear being low in the ship, the water-line armour and armoured deck might be dispensed with, before and abaft the battery. If it is considered advisable to carry more and lighter guns than the "Victory" does, the guns in the armoured battery might be reduced in size (the system being good with any weight of gun), the difference in weight being made up by mounting guns on the same deck before

and abaft the battery ; but this would, probably, be a loss of fighting power.

It has been observed that in the "Northampton," a shell entering the side abaft the foremost bulk-head, if fired obliquely, would probably be brought up and exploded by the after bulk-head, causing great damage, though traverses have been introduced to localise the effect of a bursting shell ; the weight of the traverses to be effective must be considerable.

Although a similar case might occur on board the "Victory," for instance, a shell coming into the unarmoured battery, before or abaft, might also strike the bulk-head and burst, but its action would be more isolated than in the "Northampton."

Though a protected cruiser might be all the better for armour round her entire water-line if she could carry it with ease, which is doubtful ; it might be useful in all cruisers large enough to admit of it, to introduce the curved armoured deck, under the gun deck, but extending only from abaft the engines to before the boilers, touching the ship's side well under water, the space between armoured and gun decks being filled with reserve coal.

The "Inconstant" class might perhaps be treated in this way.

As cruisers will frequently have to chase, and perhaps sometimes to retire before superior force, the importance of efficient bow and stern fire is evident.

Of all the qualities required for this class, speed and coal-carrying capacity are the most important, the ship having superior speed can avoid action ; if she fights she can choose the most favourable position, and if she has long range guns she can use them to the best advantage ; if she meets an enemy of superior force, she can accompany and watch her till her intentions are discovered, and then steam off to give the alarm, or to give assistance.

The chief objection to the present cruisers is the lightness of their armament, the "Inconstant" being the only one efficiently armed. There is little doubt she would capture or destroy the "Raleigh" or "Shah" in a short time, the ships being equally well handled.

The six vessels of the "Comus" class will be a valuable addition to our cruisers, if they carry decent guns.

For the China station, cruisers are required capable of steaming well against the monsoon.

It is presumed that all vessels will now carry steam launches as a protection against torpedo-boats. Great speed will not be wanted, but the object to be gained will be facility in lowering and hoisting at sea.

#### Class F.

##### *Other Vessels.*

The twin-screw gun vessels, carrying 6½-ton guns, and drawing little water, are very efficient for river work, their only defect being liability to foul their screw ; they are, however, getting old, and have been constantly in use.

The gunboats of the "Mallard" class are more useful for harbour and



coast work than for shallow rivers, as they draw more water than the twin-screw, their armament is not heavy, but is as much as can be practically worked on the beam without an inconvenient heel; having a simple lifting and well immersed screw they are better adapted for coast work and steaming against a head sea than the others.

When used on the coast, they would probably be more effective if armed with a  $6\frac{1}{2}$ -ton gun forward, working under a light field-gun forecastle, and having two or three 20-pounder guns mounted on easily worked carriages and slides on their broadside, the two after ones being able to fire right astern. This arrangement would not, however, do in a river unless there was a convenient bend, as the ships would have to fight at anchor, or with their heads to tide or current.

The new gunboats of the "River" class being shorter and more handy with greater beam, might mount a  $6\frac{1}{2}$ -ton gun forward instead of the two 64-pounders.

The gunboats or floating gun-carriages of the "Snake" class will be invaluable in the attack and defence of coasts and rivers. It will probably be necessary to greatly increase their number and size, the Chinese gunboats ("Gamma" and "Delta") being good specimens of the boat required. Mr. Reed's suggestion of forging stems, stern-posts, and other heavy forgings for vessels of this class, seems to be most valuable, perhaps the same stem and stern-posts would do for modified forms of gunboat; it is a question whether we should have time to put them together in case of sudden invasion, but for any other case of war they would be ready in time.

There will be a great demand for despatch and look-out vessels in case of war, and it is doubtful if merchant steamers could be spared to do this duty without great injury to commerce. Yachts might supply a few, but several fast vessels of the "Salamis" class are wanted to augment this branch of the service; they might be fitted to use the Whitehead, Spar, or Harvey's torpedo if required.

Every port in Great Britain should have one or more look-out ship with torpedo-boat, and floating gun-carriage.

#### *Conning Towers.*

Nearly all our ironclads are deficient in a very important particular, viz.:—

A well armoured conning tower, with a cover, proof against rifles, Gatling guns, and falling spars, capable of being used for defence against boardings, and sufficiently roomy to enable the Captain and his numerous staff (consisting of Commander, Staff-Commander, Gunnery-Lieutenant, Signal-Officer, and men, bugler, &c.) to have a good look-out, and to perform their duties efficiently without crowding, and to prevent damage to the steam steering-gear, telegraphs, voice-tubes, &c., which are of vital importance to the prompt handling of the ship.

A large semaphore should be placed on top, worked from inside; and a steam-horn for making signals when flags cannot be seen. The flags might be worked from the main-deck as recommended by

Commander Noel, R.N. ; watches might be out at convenient places for this purpose, and voice-tubes laid to the signalmen from the Conning Tower. The electric light and light for flashing signals might also be worked from the top of the tower.

If this is considered important in an ordinary ironclad, how much more so will it be in a flag-ship, or group-leader ? These ships should be specially fitted as at general quarters, the idea is to manœuvre the ship and control the various arms, guns, torpedoes, rifle fire, in as nearly a similar manner as would obtain in action ; it would be clearly to the benefit of the service if the duty were carried on from the same place as it would be in action.

The "Swiftsure" has a small bullet-proof iron pilot-house on top of her exposed spar-deck, and just under the main-yard ; it may be entered either by a door opening on the spar-deck, or by a small hatchway and ladder from the upper-deck battery.

Inside the house, which is so small that the view is limited, and that only two officers can find room to work efficiently, are the steam steering-wheel, the telegraphs to the engine-room and to the ordinary steering-wheel, which is worked under cover in the magazine flat, voice-tubes to the engine-room, protected-wheel, and two batteries ; on each side is a director and an electric firing key. Every naval officer knows that a Captain must have a numerous staff, and a well-considered system of communication to all parts of the ship, which must be previously arranged and practised, to render it possible to manœuvre an ironclad efficiently in a fleet action.

Suppose the "Swiftsure" to be engaged with an enemy who was aware of this weak point in her equipment, the enemy would probably direct a severe fire from rifle and Gatling guns on to the spar-deck of the "Swiftsure," for the purpose of driving the Captain and his staff under cover, but as there is only room for two in the pilot-house, where are the others to go ? If they remain exposed on the spar-deck they will be certainly slaughtered without benefiting their own ship. The enemy would also direct a fire of small guns and grape-shot at the pilot-house, and would probably destroy it with its fittings and the officers inside. Besides this there is a fair chance of the pilot-house being crushed by gear falling from aloft, or at least the screw might be impeded, and the door set fast by falling gear.

It may even happen that the steam steering-gear may be disabled, and even locked, while the helm is over one or two turns ; and as with the present arrangement the gear cannot be disconnected under five minutes, the ship will be unmanageable during that time. Perhaps a system of clutches, worked by a lever might enable the steering-gear to be disconnected almost instantaneously.

Injury to the telegraphs and voice-tubes would hamper the Captain very much, as passing the word along in an ironclad with the battery and water-tight doors closed, is not easy, the engines and helm could not be worked ; how could orders be conveyed with that promptness and certainty which is essential to the proper handling of a ship in a fleet action ?

This subject brings strongly before the mind the immense import-

ance of simplifying the transmission of orders, either by signal to ships, or by voice throughout the ship, and of reducing the necessary orders to a minimum; this would be effected as regards the signals in the manner recommended by Commander Noel in his book, "The Gun, Ram, and Torpedo." The system should be brought down to the internal organization of the ship, the Captain informing his officers previously of his directions for action, in case of every contingency. It may be fairly assumed that the fleet in which the fewest signals, and the ship in which the fewest orders are required to produce the desired result, will be most successful in naval warfare.

Another phrase of naval warfare is not sufficiently considered, viz., the probability of casualty to the Captain and the senior officer. It is quite possible that a comparatively inexperienced officer may be required to assume the command of an ironclad in the middle of an action—it is for this reason that the necessity for an armour-plated steam target-ship has been so strongly advocated, as it will afford lieutenants the opportunity of manœuvring their ships with a view to making the best possible use of their gun power, and it is most essential that ship-handling should be practised as early as possible in every officer's career, and that every officer who would succeed to command of ship, quarters, or any other particular duty, should be occasionally given the opportunity of doing so.

Ironclad target-ships with steam power are indispensable if it is desired to raise the gunnery practice of the Navy to its proper standard, of which it falls far short at present.

Commander Wallace B. McHardy advocated these vessels in a paper, written in the "Journal of the Junior Naval Professional Association" (now unfortunately extinct), in a most convincing manner; he also pressed most strongly the importance of eye-training and judging-distance practice; the same subject has been so ably handled by the officer named above, and also by Commander W. Dawson in an article on "Naval Science," "Naval Gunnery Training," and elsewhere, that little more can be said on the subject, except that there are a great many officers in the Navy who believe that these vessels are absolutely necessary to obtain the full value of our guns.

While it may be safely asserted that the Navy falls far short of a proper standard in gunnery practice, it is not the fault of the men, who show the greatest aptitude for accurate shooting, and who are at present equal if not superior in skill to the men in foreign navies; but no man can become a good seaman-gunner who has not the opportunity of firing at a moving target, judging his own advance, and having the position of his shot with the true and estimated distance carefully registered, that he may find out his "personal error," and correct his mistake.

With our present system of few and heavy guns, of firing valuable ammunition, and with such immense stakes resting on good shooting, it must obviously be of the most vital importance that the projectile should do its duty, and not be thrown into the sea.

This is perhaps the weakest point in the Navy, but it can be easily and cheaply remedied by using some obsolete ironclad as a target-ship;



or, still better, building special targets, and by firing from barrels fixed to the gun, using special sights suitable to the trajectory of the barrel. The target-ship might be steered on a previously determined course, or the officer coursing her would manœuvre her by aid of mirrors or of the camera obscura in perfect safety (electric steering might be used).

Officers would have the invaluable practice of handling their ships of various classes so as to keep their guns bearing, and make the most of their gun power; it would cause the men to take a lively interest in their shooting, and to carefully observe their own defects; it would enable officers to arrive at a very close approximation of the value of the various systems of bow and stern fire, firing at a rapidly approaching or opening object—direct or oblique—shot, shell, case, Gatling, rifle, &c. In fact it would be the heart and soul of gunnery, which, without it, is labour in vain.

The Coast Artillery would also be much benefited by practising at a moving object.

Target-boats steered from the ship by electricity might also be introduced for rifle practice.

### *Torpedoes.*

Harvey's torpedo, when carried, should be hung outside ready for slipping, but they should not be let go till they are wanted; otherwise they may cause embarrassment in handling the ship. There should be a ready means of cutting them adrift instantly when desired. The chief use of this weapon in large ships will be to deter an enemy from ramming, as, if he failed, and passed close, the torpedo would take effect.

It will be useful for despatch vessels and merchant steamers, especially where they are manœuvred for the use of this arm alone.

Its disadvantages are, the great amount of practice that is required to use it effectively, the complication of breaks and reels, and the exposure of the men working them to rifle fire, the danger to other ships, and of the tow-line fouling the ship's own screw.

It is doubtful if this torpedo will ever play a prominent part in future naval warfare, its effective range being limited by the length of tow-line that can be used with advantage.

The spar-torpedo will probably be extensively used, as it is cheap and simple in its action; can be easily extemporised; does not require any great skill in handling, and can be kept in hand till the moment when it can be successfully applied. Its use for offensive purposes will probably be confined to sloops, gunboats, and steam launches, the latter especially fitted, but even in this case, the Whitehead would be preferred, if obtainable; a combination of boats would probably be necessary. The spar-torpedo will also be used defensively from the sides of larger ships.

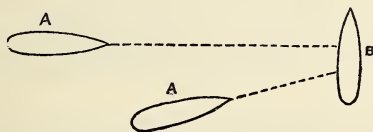
Torpedo-boats attacking a ship at anchor will probably have to oppose two lines of obstructions, and to engage other torpedo and guard-boats; they would also be exposed to a severe fire from rifles, Gatlings, and of grape and case, directed by the aid of the electric



light, therefore torpedo-boats should attack in numbers and from different quarters.

The use of the instantaneous fuze would be preferable to electricity, as simplicity in torpedo work is most desirable. Whitehead's torpedo seems to be the most deadly of all at present, and no doubt this, or some other fish-torpedo will, when quarter speed is obtained to reduce the effect of disturbing causes to a minimum, and to ensure regularity of course, revolutionise naval warfare. To increase the chance of success, it should be used in great numbers, to compensate for its inaccuracy; but it cannot be stowed in great numbers on board ship, and as, when once started, it is gone beyond recovery, it will, probably, for the present, be kept in hand till it can be used with certain effect.

If fired from the bow right ahead, it may be considered as an auxiliary to the ram, as it could be discharged effectively from A, whereas B, though escaping the ram, presents a good target to the torpedo, would have little chance of hitting A, with one fired from her broadside.



When the Whitehead torpedo is fitted on the broadside it will, probably, be fired in the same manner as the guns, the enemy passing close after failing to ram.

If fitted to start from the mess-deck or steerage of a vessel of the "Iron Duke" class, it could not be depressed so as to strike the bottom of an enemy passing very close; but if used from the sail-room or chest-room flats, the tube being under water, it would strike the enemy's bottom in a weak point.

Wherever Whitehead's torpedo is fitted on the beam, Harvey's torpedo may be safely dispensed with.

In future, every ship large enough to permit of it will, most likely, carry Whitehead's torpedoes, fitted to fire both right ahead and on the beam.

It may be doubted if torpedo-warfare will be really developed, until a separate torpedo corps is formed—the present Royal Engineer Torpedo Officers and Companies with the Royal Navy Torpedo Officers and men, and a proportion of Royal Naval Engineers, forming the nucleus of the corps. As the torpedo is so essentially a maritime weapon, the corps should be fed from naval officers of the rank of Sub-Lieutenant or Junior Lieutenant, who show aptitude for the work, and who pass a qualifying examination in the scientific and theoretical branch of the subject, the men being recruited from those seamen, gunners, and divers who seem most fitted, and a proportion from skilled artificers from the Royal Engineers, the whole being under Admiralty control.

*Sail Power for Fighting Ships.*

In the opinion of many naval officers, full rigged ships—however valuable in peace-time for the purpose of keeping up the nerve and activity of the seamen—will, in time of war, find their sail-power a fertile cause of disaster.

Sir Thomas Symonds, K.C.B., in a letter to the First Lord of the Admiralty, dated Torquay, June 1, 1874, and afterwards published in the newspapers, writes, with reference to the "Vanguard," ". . . .  
"To carry large masts, the greatest enemy of all on board."

Nothing can well cripple a ship more than a foul screw.

Falling spars, blocks, &c., would cause many casualties, and would also impede the working of the upper-deck guns. Large masts and sails retard an ironclad when steaming head to wind, more than they would help her sailing with a fair one.

If the heavy masts were removed, ballast would be unnecessary, the draught of water would be lightened, and the sail and store rooms might be utilised for stowing coal or torpedoes.

It may be safely asserted, that no other nation holds such admirable positions throughout the world for coaling depôts as Great Britain; this will give her an overwhelming advantage in maritime warfare, provided only she takes care to make them secure and keeps them well supplied.

As long, therefore, as we hold these depôts, sail-power may be dispensed with to a very great extent,<sup>1</sup> except on some stations where the coaling stations are few and far between, as in the Pacific and South Atlantic. The advantage of hydraulic propulsion for those cruisers obliged to carry sail is obvious.

Cruisers with sail-power should be thoroughly efficient under sail alone. Sailing trials would be necessary to prove them so; they should have a light spar-deck to protect their guns from falling gear; they would require a smart ship's company to make the most of the sails, and to prepare the ship quickly for action, with spare hands for prize crews.

North of the trade winds in the Atlantic, neither ironclads nor cruisers should be masted for sailing.

The Singapore division of the China station, for instance, would not require sail-power, neither would the vessels permanently attached to the depôts, as their radius of operation is limited.

*Armament.*

Although heavier guns must be carried in special ships, to compete with foreign Powers, the 35 or 38-ton gun may be taken as the most suitable for the B and C classes, and for the "floating gun-carriages" that will be necessary for attack and defence in shallow water.

No First Class Ironclad should carry a less powerful plate-piercing gun than the 10-inch of 18 tons, which combines great power with perfect handiness, and may, therefore, be considered the most effective gun for general service.

<sup>1</sup> Other nations could not so well dispense with sail-power.

The remainder of their armament should consist of 12 or 20-pounder guns for firing at torpedo-vessels, the enemy's ports, &c.; but it is essential that they should be mounted so as to afford every facility for rapid aiming and for giving great depression. Flatness of trajectory will be indispensable for these guns to compensate for errors in distance, when firing at a rapidly approaching object. Captain Scott's remarks as to the necessity of having an ample proportion of steel projectiles, with punching heads for piercing armour at an angle, and for penetrating under water and also as to the use of the most violent explosive that safety will permit for the bursting charges of shell, are most convincing. The iron rib in his system of rifling would so strengthen the shell, that combined with the increased strength of metal (steel), the size of the chamber for the bursting charge could be considerably increased.

Swift torpedo-vessels will not be able to carry any very great thickness of armour, which will, however, probably be of very superior metal, and in the turtle-back shape—to meet this it may be considered advisable to construct Gatling guns carrying elongated steel bullets with flattened heads, and weighing about one pound, for the purpose of penetrating the steel mantlets of the torpedo-vessel.

Case-shot should be increased in weight as much as possible without injury to the rifling, or rather grape-shot should be re-introduced for special circumstances when injury to the gun is of less consequence than the destruction of the ship. The supply of case is at present insufficient, and there is no grape.

For the older iron-clads and the cruisers of frigate-class, the 9-inch gun of 12 tons should be carried, and if possible 10-inch guns should be carried *en barbette* in the bow and stern as in the "Temeraire."

The bursting charge of the 9-inch common shell is 19 lbs. as against 20 lbs. 4 oz. in the 10-inch, which gives the 9-inch an advantage for the work generally done by cruisers.

As our wooden cruisers may have to engage ironclad ships, and strong forts (stone, earthwork, or even ironclad) it is essential that at least the larger cruisers should carry some 10-inch and 9-inch guns, and in the smaller vessels they should carry two or more as heavy guns as possible at the bow and stern.

The  $6\frac{1}{2}$ -ton gun is the smallest that should be carried by any but gunboats; it will pierce some of the weaker ironclads at moderate range, and carries a double shell with a bursting charge of 10 lbs. 12 oz.

The  $4\frac{1}{2}$ -ton gun and 64-pounder are very much crippled in consequence of their only projectile being a weak cast-iron shell for general purposes; both these guns should have a proportion of solid shot for firing at forts.

As boats will play an important part in future warfare, the number of pistols supplied to ships should be greatly increased, and buck-shot cartridges supplied for rifles.

Rockets are probably capable of much further development, especially as regards weight and accuracy of flight, and their great length would facilitate their penetration under water; range-tables

and sights for aiming would be required. It is also probable that mortars will be extensively used for counter-mining torpedo defences, or for throwing grapnels.

### *Bow and Stern Fire.*

The value of bow and stern fire has been questioned on the following grounds:—

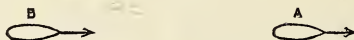
On ships meeting with intent to ram, the smoke of a bow-gun would obscure the Captain's view at a critical moment.

The closing of the two ships, and their separating if they failed to ram, would be so rapid that only one round could be fired from each bow or stern gun, and with very slight chance of hitting.

Bow and stern fire under the above conditions would probably be useless, and bow-fire positively injurious. It may be assumed that in fleet actions and in actions between single ships when ramming is the object in view, the guns will be laid near the beam and fired in broadsides in passing the enemy, when failing to ram.

Still powerful end-on fire should be retained for use in special cases,—for instance—

It may happen, as the result of a *mêlée* or other cause, a vessel A may unfortunately find herself with regard to another vessel B in the position shown in the diagram.



Unless A is so far ahead as to be able to turn before B can reach her, she must keep her course, as every alteration of it will enable B to close.

If B is the faster, she can eventually overtake A, but the difference of their speed may be small, in which case, if A has good end-on fire she may have time to cripple B before she is overtaken; on the other hand, if B is slower, but has good bow-fire she may cripple A before she can reach a position of safety. If the speeds are equal, the vessel with the most powerful end-on fire will have a clear advantage.

If both are of equal gun power, B will have the advantage in proportion as the bow is less vulnerable than the stern; in this position A would have the advantage of being able to drop torpedoes or entanglements.

How far a Whitehead torpedo, fired from A's stern or from B's bow, would be deflected by the wash of A's screw is doubtful; A, however, would have the advantage of going in the same direction as the torpedo, which would thus have to travel further, whereas B would be meeting it.

Suppose the "Bellerophon" to be in the position of A, and both ships are steaming 14, 12, or 10 knots, the "Bellerophon" turns her half circle in about 2 min. 5 secs., and must be respectively at least 971, 833, or 693 yards ahead before she can venture to turn, these being the distances B would pass over at the speeds named in 2 min. 5 secs., without making any allowances for misjudgment of distance or other disturbing causes.



If the "Bellerophon" going 12 knots is within the limit of danger in turning, say roughly 850 yards, and the excess of speed of B is two knots, she must keep her course, but 11 min. 45 secs. must elapse before B can ram her, during which time, at short range, decisive results might be obtained by the guns or torpedoes.

It is stated (page 280 of No. LXXXVI of the "Journal of the Royal United Service Institution") that the "Devastation" can reverse her powers as a ram and steam full speed in an opposite direction in 2 min. 2 secs. It is doubtful how far it would be advisable to use her stern as a ram, or how she would steer under stern-way.

All-round-fire would be most useful in case a vessel was disabled in action if she was engaging more than one object, as scattered forts or perhaps a fast torpedo vessel on either quarter, if at any time she meets an enemy inferior in speed and end-on fire, in which case she might chose an advantageous position, although the other ship throws a heavier broadside; and, also, if she gets on shore—which must be expected in blockading an enemy's coast when lights are out and other marks removed—for in war time many risks must be run to make success possible.

The best method of obtaining efficient end-on fire seems that proposed by Captain Scott, R.N., for the main-deck of the "Victory," in No. LXXXVII of the "Journal of the Royal United Service Institution." In ordinary cases the gun would be kept on the beam, with the ports not in use shut, and shifted to the other bolts for special occasions.

The only objections seem to be that in case of an enemy's bow striking in the angle formed by the projection and ship's side, her stern would be thrown round and she would penetrate the "Victory's" side, whereas if it was smooth she might glance along it. This might be remedied by a sweep piece filling up the angle, and also the weakening of the armour by having three ports for one gun; but heavier ports with powerful opening and shutting fittings might be employed to keep out projectiles, and to save the men from the concussion of the adjacent gun when trained on the bow or quarter.

With regard to the bow and stern fire from the upper deck of the "Victory," it is a question whether two lighter guns would not be more useful in general service than the one 18-ton gun, as in chasing or being chased, the enemy might, if handier and swifter, yaw so as to necessitate the gun being shifted to the other fighting bolt, causing delay and a reduction in the number of rounds fired; whereas if the other ship had two 12-ton guns she could always have a gun bearing on the "Victory."

The most important reason for having the two lighter guns, is the probability of the ship being attacked by two or more fast torpedo-vessels at the same time. If the single heavier gun is preferred, it would probably be more effectively mounted *en barbette*, as in the "Temeraire," but with a gun mounted in this manner, unless it recoils under cover to load, the crew would suffer very much from rifle fire.

The "Hotspur" or "Rupert," having only one turret and that one forward before the funnel, would find themselves in an awkward

position if they were caught, like A in the diagram, by a vessel of equal speed and handiness.

The position of B is called by Admiral Ryder the "weather gage" of future actions, (see No. LXXIX of "Royal United Service Institution Journal"). Attention is also forcibly called to the value of a double ram-bowed vessel worked by the turbine.

## II.—*Protection of Commerce.*

We cannot protect our commerce without a sufficient number of outlying depôts.

If these are not securely defended, they will be captured by the enemy, and used as bases of attack against our commerce.

Every Government employé at the depôt should be trained to some branch of warfare, and be under military law.

The male civilian population between certain ages should be obliged to become efficient members of the Local Defence Corps, which should be commanded by Naval or Army officers according to the particular branch of the corps.

On the outbreak of hostilities, the depôt should be placed under martial law.

Depôts should have despatch, look-out, gun, and torpedo-vessels permanently attached to them; and, in some cases, even mastless iron-clads.

The telegraphic, signalling, and range-finding systems should be as perfect as possible, and include the means of repairing telegraphic and torpedo cables.

A system of ground-torpedoes and mortar-fire is essential to the defence; also, if possible, plunging fire from scattered guns.

The Moncrieff system of mounting guns should be largely used, as it is most difficult for ships to disable guns mounted in this way.

In consequence of the development of Whitehead's torpedo, the value of a mole covered by guns has greatly increased. The entrance of the mole could be closed by a boom with chain or wire nettings attached.

It is essential to have places where vessels can lay alongside in safety with their fires out, to effect small repairs, or to clean boilers.

The mole affords every facility for coaling, for cleaning coal-ships, storing and for protecting coal, and for effecting repairs under water by means of divers or a coffer-dam.

Where there is little rise and fall of tide, it may be constructed so that in some parts a ship may fire her guns over it, and have her water-line and bottom protected.

Iron pontoons filled with ballast and sunk so as to be a few feet above the high-water mark; or iron booms, built on the cellular system, with chain-nettings, might be used to protect vessels under repair in such places as Simon's Bay.

A 1st-class depôt should be one at which both men-of-war and merchant steamers could be docked and have their machinery repaired, fill up with coal, provisions, and warlike stores, send sick men to hospital, and draw men to fill vacancies.

The following places should be ranked as 1st-class dépôts:—

Malta, Bombay, the Cape (Simon's Bay), Sydney or Melbourne, Halifax, the Falkland Islands (Stanley Harbour), Vancouver's Island, Singapore, Hong Kong, Bermuda, and Jamaica, eleven in all.

Where these places fail to satisfy the above-mentioned conditions, they should at once be raised to that standard.

A 2nd-class dépôt should at least be a securely defended coaling-station, with ample supplies of provisions and warlike stores.

The following places should be ranked as 2nd-class dépôts:—Antigua, Quebec, Saint John's (Newfoundland), Heligoland, Sierra Leone, Ascension, St. Helena, Mauritius, Aden, Perim, Karachi, Galle, Trincomali, Andaman Islands, Penang, Labuan, the principal ports in Australia and New Zealand, and Fiji Islands.

Gibraltar stands by itself as our most important outpost, but it will be a coaling station for men-of-war rather than for merchant steamers.

Our cruisers will be required to watch:—

All places where we possess stores of coal undefended; also those neutral ports from which hostile cruisers could be fitted out, and where they can replenish with coal; among others, for instance:—

Brest, Vigo, Lisbon, Cadiz, the Azores, Madeira, Canary and Cape de Verde Islands, Fernando Po.

The United States Atlantic ports, Aspinwall, Havana, Martinique, Guadeloupe, St. Thomas, the Brazilian ports, and Monte Video.

Manilla, Ke-lung, Batavia, Surabaya, Macassar, Japan, and the numerous anchorages on the coast of China.

Valparaiso, Callao, Panama, San Francisco, and the Sandwich Islands.

A nation intending to go to war with England, but not having a sufficiently powerful fleet to attempt an invasion, or to engage our ironclad squadrons on equal terms, would exert all its power for the destruction of our commerce.

Attempts would be made to block the Suez Canal in several places, under the pretence of accident by collision, fire, explosion of cargo, &c. To cause incendiary fires in our arsenals, dockyards, coal stations, and on board our ships.

Trusting to slow ironclads, gunboats, and torpedoes for home defence, the fast ironclads, wooden frigates, and corvettes would be sent to neutral ports to await events. These ships would carry as many men as possible for distribution.

Secret agents would arrange to purchase suitable vessels for conversion into armed cruisers.

Certain unfrequented harbours would be selected as rendezvous, at which, on a given date, these steamers with coals, provisions, and warlike stores would concentrate and be organized under the protection of the men-of-war.

Large bounties and promises of prize-money would enable them to complete their crews.

Dépôts of coal, &c., would have been secretly established (perhaps



buried) at several out of the way places, and large supplies would be obtained from captured vessels.

The concentration and organization would probably be effected without molestation, and the newly-created force would be greatly superior to our local squadron.

They would proceed without delay to attack our commerce and colonies, overwhelming in detail our slightly defended coaling stations, burning coal, stores, &c., with wooden piers, jetties, and lighters, destroying patent slips, docks with their caissons and pumps, steam factory plant, &c., blocking up moles, cutting telegraph-cables and wires in such a manner as to prevent their quick repair, dismantling forts, lighthouses, removing beacons and buoys, capturing such vessels as they require for cruisers or store-ships, and sinking the remainder in such positions as to obstruct the navigation and trade. Their chance of success in these raids will depend chiefly on secrecy, and on being beforehand with us.

Should they meet with reverses or a superior force, they would disperse and continue their depredations wherever the best opportunities offered.

Their cruising grounds would be governed by the relative value of our trade in the different seas, and by the means of obtaining coal. Probably their operations would be confined to the North Atlantic, south-east coast of America, the inlets in and about the Magellan Straits and the Eastern Archipelago.

It must be remembered that the success of the "Alabama" as a cruiser depended largely on the use of our coaling stations.

To avoid protecting two routes, our trade with the East and with Australia will very likely be carried on entirely through the Suez Canal; should, however, any accident happen to the Canal, the importance of the Cape could hardly be over-estimated, and it is almost certain that an attempt would be made to capture Cape Town and Simon's Bay, unless they are well defended.

Our merchant steamers must be lightly armed, fitted for using Harvey's torpedoes, strengthened at the bow for ramming, and divided into several watertight compartments.

The guns supplied would depend on the stores of guns, ammunition, and gun-carriages available, and would probably consist of converted 64-pounders (revolving), with Armstrong 12 or 20-pounders on the broadside. The crews of these steamers must include enough officers and men of the Royal Naval Reserve to work the guns and torpedoes efficiently.

The fast ocean steamers would trust principally to speed for safety; but as they approach the narrow waters at either end of their passage, or where they have to pass through straits such as those of Gibraltar, Malacca, Sunda, Magellan, Bass, &c., they must be defended locally by our cruisers, who, having a protected coal depôt near at hand, could afford to chase at full speed, whereas the enemy's cruisers would have to economise their coal. The system of convoys must be revived for the slower steamers, the speed being regulated by the coal-carrying capacity of the men-of-war attached.



The convoys should be small, so that they may not be thrown into confusion by an attack. Ten merchant steamers lightly armed might be convoyed by one man-of-war, and in case of being attacked by two or three cruisers should assume the offensive; or they might at any time be dispersed to re-assemble at a given rendezvous. Towing would be resorted to at times in fine weather to economise fuel.

One or two gunboats might be towed in summer.

Suppose a fast steamer, A, being in the open sea, observes an armed cruiser, B, ahead.

A has the following courses open to her :—

She alters course 8 points and tries rate of steaming, if she draws away from B she will soon be able to resume her course; but if not, she must bring B right astern, and trust to night or a lucky shot from her 64-pounder.

A may, however, catch B under sail with banked fires, in which case she can either ram B or pass her out of range; her cargo would probably be too valuable to run the risk of ramming.

The safety of B would depend very much on smartness in raising steam, shortening sail, and, weather permitting, lowering her torpedo boats.

This opens the question of the vessels required for cruising and their management; also how far private signals can be used between cruisers and merchant steamers.

Should cruisers act singly or in pairs, &c.

The cruisers are described under the heading Class E, in Part I.

### III.—*Naval Volunteer or Supplemental Force.*

All our Reserve Forces for the Navy come under this heading.

The Royal Marines (Artillery and Light Infantry).

This corps must be considered the best and only reliable reserve for expanding the Navy to its war footing, for the following reasons :—

Few Royal Navy seamen, after leaving, seek employment in the merchant navy, and this small number is not likely to be increased, for after the comparatively easy work and comfort of the Royal Navy, they are unwilling to undergo the hard life of a merchant seamen, therefore, if they do not enter the Coast Guard, they take any employment ashore in preference to sea service, and naturally deteriorate as seamen.

Consequently, we cannot expect a large reserve from men who leave the Navy.

The Coast Guard would form such an excellent nucleus for a Coast Defence Corps, that it would be undesirable to withdraw them in any number from the coast in time of war. Some of the younger men might, with the Marines, be told off to man the Home Defence Iron-clads, taking the duties of quartermasters, coxswains of boats, captains of turrets and guns, &c.

The organization of the Coast Guard is capable of being easily adapted to any requirements.

The chief duty of the men, who are all trained men, would be to supply the disciplined element in the Coast Defence Corps. Among

them may be found signalmen, seamen gunners, torpedo men, and stokers; most of them have been petty officers, and accustomed to take a leading part. Their local knowledge of pilotage, and their skill as boatmen, peculiarly fits them for torpedo work.

The system might, with advantage, be extended to the Colonies.

Only a small number of Coast Guard men, then, can be spared to join the fleet.

The Royal Naval Reserve are a most valuable body of men, and should be increased as much as possible; but in war time they will be wanted to form the principal portion of our merchant crews.

The bulk of our trade will probably be carried on by ordinary merchant steamers under convoy; they will be lightly armed, and will be required to act in concert with the men-of-war attached to them. Their crews will necessarily be more numerous, and a proportion of signalmen will be required for each ship.

In war time, there would be such a demand for Royal Naval Reserve men for the merchant ships, that few would be available for the fleet.

The Royal Naval Artillery Volunteers would be merged into the Coast Defence Corps.

The boys under training cannot be called an immediate reserve. They would be kept under training till about 18 or 20, and should not be sent into the general service cruisers in peace time before that age, especially when we consider the dangerous excess of young ordinary seamen among our ships' companies already in small ships, weak enough numerically. The greater part of these youngsters will, no doubt, grow up into able-bodied men; but at present, for the purposes of boarding, handling heavy charges, projectiles, and cables, or for sustaining continued hard boat-work, they are unfit to cope with the men who compose the crews of most foreign men-of-war. They swell the sick list whenever hard work is to be done, even in peace time. We must not commit the error of opposing boys to men.

If, then, we cannot get sufficient men for the fleet from the reserve of Royal Navy seamen, the Coast Guard, the Royal Naval Reserve, the Royal Naval Artillery Volunteers, or the training ships, we shall have to fall back on the Marines, and, in addition, such able-bodied landsmen and inferior seamen as we can get, in which case, perhaps, the Marines will be required for the maintenance of discipline. It will be more fitting to consider the Marines in their place as part of the standing Navy.

It is proposed to divide the Naval Reserve Forces into two branches, viz. :—

A. The Royal Naval Reserve (for general service).

B. The Coast Defence Corps (for local service).

A. The Royal Naval Reserve (for general service).

It is very desirable to create a good feeling between the Military and the Mercantile Marines, and, by careful management it may be possible, at some future time, to organize the two services in a somewhat similar manner to the French system. The change, however, must be gradual.

If trade is, in war time, to be carried on under convoy, the import-

ance of a clear understanding and perfect harmony between the men-of-war and merchant vessels under convoy is obvious.

A system of convoy organization and tactics should be compiled, in which the duties of every one, commanders in charge of convoy, of men-of-war and merchant vessels, owners and agents, should be so clearly laid down that no doubt can exist on the subject.

Encouragement should be given to the officers and men of the Royal Naval Reserve to perfect themselves in day and night fog-signals.

Those officers running to foreign ports where it is unusual to send our men-of-war, especially those in the Baltic and east of Calais, should be required to pass in the pilotage of those ports, and should have a distinguishing mark placed against their names.

Mail steamers and hired troop and store ships should be solely commanded, officered, and manned by Royal Naval Reserve.

In 1873 it was deemed advisable to introduce the new rank of Midshipman Royal Naval Reserve. It would tend to keep those officers efficient if they had to pass Admiralty examinations, in addition to those of the Board of Trade, and to produce certificates of good conduct and practical ability before being promoted to the rank of sub-lieutenant.

Sub-lieutenants Royal Naval Reserve should be required to make a short cruise in a man-of-war before being eligible for promotion to lieutenant.

If it is desired to foster sympathy between the Royal Navy and the Royal Naval Reserve, the drill ships should be fitted so that the men under training could live on board, subject to the ordinary naval discipline, and receiving rations.

These ships should be rigged, not for the purpose of teaching the Reserve seamanship, but to accustom them to our fittings and system of working together.

They should be officered at least by a commander and two lieutenants, one of the latter to be always on board, with a proportion of warrant officers, seamen, and marines (the seamen to be picked A.B.'s).

The Reserve would soon learn to prefer the comfort of a man-of-war to a dirty lodging-house.

There would be a canteen on board, and ample leave would be given.

By mixing with the permanent crew, mutual respect would be created, the Reserve would gradually be initiated into the manners and customs of the Navy, and learn that habitual neatness aloft, about the decks, and in their dress, which is so essential to discipline.

By this means, old prejudices would be softened down, a better organization would be rendered possible, and the men, when called out for service, would feel at home on board a man-of-war.

The weak point, however, in the training of the Reserve is, that they get little if any firing at sea, under the same conditions as would exist in action. They should also be practised at judging distance, and simple fitting of fuzes (letting the inside alone). As from the nature of their duties, merchant seamen in large ships are not good boatmen, and as they might have to assist in disembarking troops and stores from hired



transports, boating should be included in their instruction ; but, above all things, the object should be to make them good shots with gun, rifle, and pistol, at moving targets, and firing from a moving platform.

To effect this, gunboats must be attached to each district. To save expense the old plan of fixing rifle-barrels on the gun might be revived and improved upon. The barrel should carry a projectile at least one pound in weight, and be fitted with special sights.

Lowering and hoisting boats at sea might also be practised.

The commander and other officers would have a good opportunity of learning and practising the pilotage of our own coasts (a weak point at present, especially on the east coast).

A large number of men might be passed through these boats, and they would be efficient and in their place if war broke out.

Officers who have passed in pilotage or torpedo practice should be distinguished by placing **P**, **T** against their names in the Navy List.

For the men the ratings of marksman (gun, rifle, and pistol), signal-man, sail-maker, torpedo-man, and skilled stoker might be introduced, the latter to pass an examination at a Royal Dockyard or on board a first-class reserve ship. All boys' training ships should be under Admiralty control and naval discipline. As the present officers die out, vacancies should be filled up from the Active List by officers who have been employed in the Naval Training Service.

After a course in the harbour ship, the boys should serve a year or more under strict naval discipline on board one of the sea-going sailing training vessels attached to the home station; or in case of the Colonies, to the local one. The best should be attached to the Royal Navy. A certain number should receive special training as stokers in the coast defence vessels and dockyards. At the end of their course they should be classed and drafted into the merchant service as Royal Naval Reserve seamen or stokers.

The case of reformatory ships is a difficult one. The cargo of a merchant ship is very valuable, and bad characters should be weeded out as much as possible; as the standard of the merchant service improves, there will be less room for them, at any rate, doubtful characters are better placed ashore under the eye of the police, than in a merchant ship, where they can do so much harm; besides, the reformatory boys do not turn out so strong or healthy as the others.

### *B. The Coast Defence Corps.*

It is proposed to expand the present Coast Guard into a Coast Defence Corps, which shall absorb all Naval Reserves and other corps, except the active Royal Naval Reserve for general service.

The Coast Guard men would be continued in their present duties, and would supply the principal portion of the disciplined element of the corps, in fact they would be the permanent staff.

The remainder would consist of:—

Pensioners and Reserve men from Royal Navy and Royal Marines who are willing to reside on the coast in their district.

The Royal Naval Reserve men (number to be limited at present)

who, belonging to coasters, or having served a fair time in the Reserve, may wish to join a home corps instead of the general service reserve.

The coast population, especially boat and fishermen, who would receive a small retainer, and would be specially suitable as pilots, and for working ground torpedoes.

The Royal Naval Artillery Volunteers should be invited to join, as also should be the Military Volunteer Artillery Corps of the coast towns, in which case they should be transferred from the War Office to Admiralty control.

The coast brigade of Royal Artillery would find ample employment at our fortified arsenals and dockyards.

Perhaps the Royal Marine Artillery would, after a certain service, be allowed to join the coast brigade, they would be well fitted for duty in those forts intended to engage men-of-war.

A system of training might be organized for boys who, though not wishing to become sailors, are willing to join the local corps, but boys should not be counted on the strength of the corps.

The Coast Guard is under the command of an Admiral Superintendent (whose staff consists of one secretary, two clerks, and one writer), and is divided into nine districts, each under the charge of the captain of the first reserve ship attached to that district. But in case of war these ships would be called away from their stations to form a squadron or to cruise, thus removing the district captain at a most critical moment.

The districts are subdivided into 73 divisions, commanded by inspecting officers, of whom 34 are commanders, 28 lieutenants, 2 navigating officers, and 8 Coast Guard officers.

These 73 divisions are again subdivided into 230 stations, each in charge of a chief officer (about equal in rank to a Warrant-officer Royal Navy), all of whom, with the exception of 38, have passed in navigation.

The appointments of inspecting officers of divisions do not seem to be made on any definite principle.

The officers range from commanders with seniority of 1864, through commanders 1874, and lieutenants of 1855 to lieutenants of 1868. In the case of lieutenants, though remaining on the Active List, they are considered as practically shelved.

The men consist of 4,000 well drilled seamen.

If the system is extended to the Colonies the force would be reduced.

To have an efficient Coast Defence Corps it must be entirely under the Admiralty, except within the limits of the fortified arsenals and dockyards, where a special local organization must obtain under joint naval and military control.

The expansion and re-organization of the Coast Guard is the basis on which the proposed corps is to be formed.

We have already—

An Admiral-Superintendent of Naval Reserves, who would have entire control of the A and B classes with their respective training establishments. His jurisdiction would extend to every part of the coast except the fortresses.

His staff, in addition to his secretary, should consist of—

A Captain Royal Navy, as chief of the staff and second in command.

A Staff-Captain or Commander.

A Colonel or Lieut.-Colonel Royal Marines or Royal Marine Artillery.

An Inspector of Machinery.

A Flag-Lieutenant (from gunnery branch).

A Torpedo Lieutenant.

A sufficient number of junior clerks and writers should be appointed to relieve the Admiral and staff from unnecessary clerical work, and enable them to devote their whole attention to their higher and proper duties of inspection and organization.

### *The Command of Districts.*

A difficulty arises here from the fact that the districts are at present under the command of senior captains, who are also in command of the first reserve ships.

The officer in command of the district should be a senior captain, he should live on shore, and remain at his port in case of war.

The value of the first reserve ships is undoubted, but there can be no reason why the ship should not be commanded by a captain junior to, and under the orders of, the District Captain.

It may be objected that the expense is doubled, but the work done will amply repay the expenditure; besides it is of vital importance that the Coast Defence Corps should be officered in the higher ranks by Royal Navy officers.

Each Captain of a District should have a staff consisting of—

A Gunnery Lieutenant.

A Lieutenant Royal Marines or Royal Marine Artillery.

A Chief Engineer.

A Secretary (Assistant-Paymaster).

With a sufficient staff of writers (who should be trained men).

The District Captain would control—

The A and B classes.

The training and drill ships and mastless ironclads.

The gun, torpedo, look-out, and fast despatch vessels and their crews.

The batteries, field-guns, signal stations, and ground torpedoes in his districts.

He would furnish his chief with necessary statistics, on which the schemes of mobilization would be founded. His office would be in telegraphic communication night and day with each divisional headquarters, with the office of the Admiral-Superintendent, and the military commander of the district.

He should be supplied with a series of numbered orders explaining in detail how he is to act in the event of certain contingencies. He should supply his divisional officers with similar orders.



On receiving the telegram "No. IV" (proceed in the execution of) he would know how at once to act without hesitation or delay.

This would be a step towards decentralisation and would leave the mind of the Admiral-Superintendent free to consider passing events, instead of being distracted by hurried organization.

The districts might be re-distributed with advantage and prominence given to those parts of the coast most open to invasion.

It is a question whether the district between Harwich and Dover, where the trade to London becomes concentrated, should not be commanded by an Admiral (junior to the superintendent).

### *The Command of Divisions.*

Every division should, if possible, be under a Commander on the Active List.

The position will be a difficult one as the Divisional Commander will be the officer brought into more immediate contact with the men of a mixed corps, many of whom would be unaccustomed to discipline. Discipline is the weak point of all Volunteer forces. To ensure a reliable Coast Defence Corps, the duties and responsibilities of officers and men must be clearly defined, and, if necessary, a law passed, placing the corps while on duty under strict naval discipline, and giving the officers down to divisional officers the power of summoning the attendance of individuals, and of requisitioning whatever may be necessary to the corps, under severe penalties for disobedience or resistance. Half measures will be of no use in war-time.

The present number of Commanders on the Active List would not be sufficient to carry out the proposed scheme, as many would be withdrawn for sea service.

If it is not deemed expedient to increase the Active List, Lieutenants of 10 years' seniority, who are in all respects eligible for the rank of commander, but who cannot be promoted for want of vacancies, might be made commanders in the Coast Defence Corps and placed on a separate list. Before receiving the appointment, they should qualify in gunnery, torpedo-practice, and the local piloting of their district.

The Divisional Commander should have a staff consisting of—

A Sub-Lieutenant (promoted from Torpedo Gunner).

An Engineer.

A Carpenter (warrant officer).

A Chief Petty Officer (for office work).

A Sergeant Royal Marines or Royal Marine Artillery (as instructor of military drills).

One or two writers (who should be trained men).

It would be his duty to keep lists of the officers and men belonging to the corps, with their special qualifications, and would detail them accordingly as officers, pilots, and crews of the gun, torpedo, look-out, and despatch vessels, steam launches, and shore batteries, ground torpedoes, field-gun, and rocket parties, signalmen, &c.

To preserve vessels, boats, batteries, arms, and ammunition in working order.

Stations should night and day be in telegraphic and signal communication with each other and with the divisional office, which would also be connected with the district office, the adjacent divisional offices, and the nearest military post.

The station officers should remain as they are at present, but might receive the rank of sub-lieutenant.

Lieutenants-commanding, sub-lieutenants, engineers, and medical officers (as in the Royal Naval Artillery Volunteers) would represent the volunteer officer element—they might receive honorary rank on retirement.

Lieutenants-commanding should be required to hold a Board of Trade certificate as master and local pilot, with an Admiralty certificate in gunnery or torpedo.

The Coast Defence Corps would be expected to partially officer and man (with the Marines) the home defence ironclads.

To entirely officer and man the gun, torpedo, look-out, and despatch vessels attached to their districts.

To furnish pilots to vessels requiring them.

To keep a look-out off the coast, and to communicate intelligence to the shore signal stations, who would forward it.

To help a friend, or harass an enemy, within reach.

To prevent or delay a hostile landing.

They should be thoroughly drilled in simple squad drill and the rifle exercises (both of which should be condensed as much as possible). This much is absolutely necessary for the preservation of order and discipline, but playing at soldiers should be prohibited.

Every care should be taken to make them good shots with gun, rifle, and pistol, particularly when firing from boats and small gunboats on the move. They must be thoroughly practised in range-finding and judging distance, (the eye must be well trained), in boating, in the use of torpedoes of all sorts by night as well as by day, and in the construction of booms and entanglements for fouling screws (a proportion should be divers).

Simple field and Gatling gun drill.

Working shore batteries (drill adapted from naval gunnery).

They should be good practical swordsmen and know how to keep their arms efficient.

Armourers would be necessary in each division.

Ratings of S.G., T.M., T.O., Engine-room Artificer, skilled Stoker, Diver, Armourer, should be established.

It must be essentially a working corps. The uniform should be of the simplest and most serviceable kind. Each man should have a blanket, haversack, a small kit, and three days' provisions ready for use.

By the proper working of this system, the naval and military Commanders-in-Chief will be kept acquainted with the movements of the enemy, which will enable them to hold the home defence squadron and the field army in hand until the enemy has committed himself to his point of attack. The coasting trade would also be efficiently protected.

Wherever possible, batteries should be placed high, with command of special facilities for depression of the guns in order to obtain a plunging fire and force the enemy to take a distant position before he can elevate his guns sufficiently to engage them. Other low-placed batteries would be required, and Moncrieff's system used wherever it can be.

#### IV. *Colonial and Home Defence.*

Our best defence is to take the initiative—

1stly, by blockading the coast of a possible invader.

2ndly, by the despatch of combined naval and military expeditions to attack or threaten the enemy wherever he may be vulnerable.

In Blockading—

Extensive use should be made of mechanical torpedoes to shut the enemy in where desirable, and to form sheltered anchorages for our ships, the entrance only being defended by electrical torpedoes.

Wherever we wish to push our way, countermines with large charges, and utter disregard of the number used, will be indispensable.

This would necessitate large quantities of torpedoes, explosives, and torpedo stores being carried in company by transports specially fitted.

It would be necessary to lay telegraphic cables, and repair them.

As lights, buoys, beacons, &c., would have been removed by the enemy, a naval surveying corps should be attached to the blockading force, with the necessary material for relighting and buoying the coast, and for laying down moorings where necessary.

A service would be organized to keep up the communications and supplies of all sorts.

Coal depôts with steam cranes, floating factories with dockyard artificers, hospital ships, tugs, fire and explosion ships would be useful, if not absolutely necessary.

As regards the Expeditionary Force :—

The men composing it should be well trained and practised at disembarking and re-embarking troops, horses, guns, and stores, the use of defensive and offensive torpedoes, the demolition of forts, bridges, railways, telegraphs, &c., in fact to sink, burn, and destroy generally.

Boats in pieces should be in store for use in lakes or inland seas.

The organization of the forces for blockading and for expeditionary purposes would probably take some time; the greater promptitude with which they are despatched, the greater chance they will have of success.

The value of a large corps of Marines for expeditionary purposes is obvious.

In all purely defensive operations, the ironclads will probably be kept ready in hand, either at anchor or under easy steam, secured from surprise by numerous look-out vessels, which will also keep the Admiral fully informed of the enemy's movements.

As the safety of London is of the most vital importance to the Empire, and the coast from Hull to Portsmouth the most vulnerable to invasion, England should never be left without a powerful home squadron, independent of the coast defence vessels, and containing at least one or two of the "Devastation" class.

The true key of the position is obviously Dover or the Downs ; but since the development of the fish torpedo, it would be undesirable for the squadron to lay at either place.

A harbour at Dover in which our ironclads could lay alongside a mole with their fires out, and without fear of torpedoes, is essential to the national safety.

The home squadron would not be drawn away from Dover until the enemy had committed himself to the point of attack. Ample information of the enemy's movements would be received from the numerous look-out ships, who would communicate with the shore stations.

At the proper moment, the squadron would receive their orders, and the deepest draught vessels could pass east or west from Dover at any time of the day or night, or state of the tide.

The next urgent necessity that presents itself is a similar harbour on the east coast.

These harbours are pressingly needed as harbours of refuge for merchant ships from an enemy, as well as in case of stress of weather (Filey has been proposed by authorities on the subject).

Sheerness (and the Medway) forms an excellent head-quarters for the light draught ironclads, which should be sufficiently numerous to enable us not only to defend our own coasts and harbours, but to operate offensively in the shallow waters eastward of Calais and in the Baltic.

We should also require at home—

A North Sea squadron.

An English Channel squadron.

An Irish Channel squadron.

The strength of the above would be adjusted to the circumstances of the war.

The head-quarters of the first-named squadron should be near the northern coal fields, and Milford Haven would be the head-quarters of the Irish Channel squadron, it has the advantage of being near the Welsh coal district, and would be a good base for sending troops to Ireland should that country be invaded.

There being so many large harbours in the north and south of Ireland, secondary stations would be required at Cork and Belfast Lough at least; fast torpedo rams will probably play a prominent part in our coast defence, but they will not be able to carry any large quantity of coal, or continue for a long time at a high rate of speed, consequently our vessels, especially in the Irish Channel and North Sea, will be close to their coal supply, which would give them an immense advantage as compared with similar vessels belonging to an enemy.

The present Channel Fleet might be called by some other name—Atlantic, Lisbon, or Gibraltar.

The other fleets and squadrons would remain as they are at present.

The number of ships required can only be determined by the strength of foreign navies (information on which subject is difficult to obtain), and the possible hostile combinations against us.

One of the most urgent requirements of an organized system of



Imperial defence is the establishment of a Naval Staff Corps and of an Intelligence Department. The chief of the staff should be an Admiral, and his head-quarters the seat of the Intelligence Department. The value of an efficient staff cannot be over-estimated. It frees the Admiral from unnecessary clerical work, supplies all requisite information promptly and in a well-digested form, and works out the details of the Admiral's plans, leaving him at liberty to attend to his higher and more important duties.

It would, then, be the duty of the Department—

To work out the details of the Admiralty schemes of action, prepared beforehand, in the event of hostilities with any nation or combination of nations.

To furnish specially qualified officers for service on the staff of Admirals and Commodores, and perhaps the staff of Governors of Colonies, and Commanders of mixed expeditions.

To collect full and reliable information on all subjects of professional importance, as, for instance—

Capabilities of British and foreign guns, their projectiles, traces of their trajectories, tables of angles of descent, penetrations at various angles, &c., and the development of torpedoes.

The dimensions, draught, turning power, speed, coal capacity, armour, and peculiarities of our own and foreign ironclads and other men-of-war (cruisers, gunboats, &c.).

To compile statistics as to the officers, men, and reserves of various nations, and tabulate the results of experiments.

To publish progressive text-books on tactics.

And to circulate the same periodically in a condensed form for the use of naval officers.

Officers of the Department should travel as necessary to obtain trustworthy information.

The Navy suffers from the following causes:—

As regards the officers—

The age of entry is so early that it is impossible to judge correctly the physical or intellectual fitness of the cadet for the service.

The Navy is generally employed in hot and enervating climates, which, together with night watch-keeping, and the frequent calls for duty, is very prejudicial to the acquirement of the theoretical knowledge now required.

The position of midshipmen on board a sea-going man-of-war, as combined officers and school-boys, is, to say the least, inconvenient.

There is no systematic training in practical seamanship, such as can only be obtained by a long course on board a sea-going sailing training ship, the cadet performing personally every duty that a seaman is called upon to do, from passing an earring or stowing a jib in bad weather, to steering the ship and getting correct soundings.

The present *viva voce* examination in seamanship is not a true test of practical ability as a seaman, or of being trustworthy as officer of the watch.

Instruction in steam should be given by a moderately long and

thoroughly practical course in the engine-room and stoke-hole, under weigh. This would give the cadet a lively interest in the subject, and would convince him of the importance of pursuing it further.

Officers generally have not the opportunity of handling vessels under steam or sail in narrow waters, of navigating or surveying practically, or of exercising steam tactics. At a sufficiently early period of their service, some officers pass four years as sub-lieutenants, doing duty as mates of decks in large ships, and spend a year or so on half-pay as lieutenants, before they have the opportunity of taking charge of a night-watch at sea.

Few naval officers are practically acquainted with the pilotage of our home coasts (especially the east coast), or of the coasts and military harbours immediately opposite.

Another examination might be introduced which lieutenants should be required to pass in order to qualify for promotion to the rank of commander.

The subjects might be Tactics, Pilotage, International and Court-martial Law, Meteorology, Economy of Fuel, and the Usages of War.

As regards seamen, up to December, 1875—

The course of instruction in the training ships for boys is supposed to last from one to two years, and includes gunnery, squad, rifle, and company drill, boating, working in rope, and drill aloft. The time for instruction is shortened by attendance at school and leave.

No doubt the boys learn a great deal—it is wonderful how so much can be crammed into their heads in so short a time—but, unfortunately, they forget what they have learnt as fast as they picked it up, or faster. They leave the training ships (where they have been carefully looked after, and not been hard worked manually), in apparently good discipline, well-dressed, neat, and clean.

Some, after a passage in a troop or store ship, where they have to look after themselves, arrive on board their proper ship slovenly, dirty, and undisciplined. Many of them who join ironclads are put on the forecastle or quarter-deck, and for weeks or months go no higher than the top; and as the ship when at sea is generally under steam, even those stationed aloft get little real work.

Others go to the first reserve ships, where their chances of learning their duties as seamen are far less, the ships being seldom at sea. Others, again, go to small ships starting on long voyages to hot and enervating climates. All the instruction they get is the necessary work of the ship. They miss the good feeding of the training ship, and have not sufficient stamina to stand the incessant hard work of a small ship; this, together with sea-sickness, brings them to a low state of health, and they become an incumbrance rather than an assistance; it is also hard on the remainder of the ship's company.

In all these cases, the boys have forgotten much of what they had so imperfectly learnt, that instead of their instruction in a sea-going ship commencing where they left off in the training ship, they have not only to be re-instructed, but the instructors have to eradicate many loose and careless habits of drill, which have been passed over in the training ships, not through the neglect of the instructors there,

but as the natural result of the high pressure required to pass the boys through the mill in such a short time.

Another evil is—

The boys being rated ordinary seamen 1st or 2nd Class at 18, or, at the latest, 18½, enjoy the same privileges as the men (for the young ordinary seamen cannot be called men) as regards general and night leave.

Many of them pass a considerable time waiting in the depôt ships at the home ports, and naturally avail themselves of every opportunity of going ashore. Their pay is not sufficient to meet the expense of this; and, as Captain FitzRoy observes, they borrow money at great usury from the "Lower Deck Bankers," and, in many cases, become so hopelessly involved, that they desert.

When on night-leave, they have to choose between hiring a waterman to take them off to their ship, or paying for a bed in a (perhaps dirty and uncomfortable) lodging-house.

In the morning they have a drink before coming off, which renders them stupid at drill and insubordinate. The age at which they are rated, and the following two or three years, is the time when they are by nature most troublesome and insubordinate; it is, therefore, the age when discipline must be most stringently enforced.

The able seamen are affected by the want of having been systematically and carefully trained as boys and ordinary seamen.

In working aloft, they are careless and slovenly in small details.

At gun-drill, they will slur over the important details of sponging, loading, adjusting sights and scales correctly, and they will fire when the sights are not on.

They perform their rifle and cutlass exercise in an equally careless manner, ignoring the instructions laid down in the drill books.

They are careless in their dress, and putting on their belts.

In fact they clearly show want of discipline, resulting from inattention to small details.

A conclusive proof of this is their general neglect, when on shore, of saluting military and even their own officers in passing; in some cases they do not even get out of an officer's way.

In speaking of slackness at drill and slovenliness in dress, the seamen gunners are not included.

The petty officers are slow to assume their proper position and assert their authority, but they are gradually improving in this respect.

The proportion of petty officers and leading seamen to the remainder of the ship's company is excessive, and works against the petty officers taking a proper position; but where strict discipline is maintained, the petty officer is able to take charge equally as well as the non-commissioned officer in the Marines or the Army, and blue-jackets make as efficient sentries as can be found in any other force, without suffering any deterioration, as I can see; on the contrary, they are improved by occasionally doing sentry.

Barracks for seamen, on the same principle as the Marine Divisional Barracks, with mastless ironclads, a masted frigate, brigs, gun and



torpedo boats, and an armoured steam target-ship attached, also sea-going sailing training frigates, are absolutely necessary to raise the Navy to its proper standard and maintain its efficiency.

A great deal of a seaman's duty can be learnt in barracks and the neighbouring harbours and coast, with the assistance of the ships and boats above mentioned, better than on board an ordinary man-of-war.

For instance—

Elementary gunnery and eye-training.

Rigging and stripping ship; elementary sail and spar drill.

Squad, company, musketry, rifle, cutlass, and pistol drills.

(The military drills should be taught by Marine officer and non-commissioned officer instructors, and the stokers should go through a course of disciplinary drill.)

Boating.

The tidal creeks and sandy beaches in the harbour would furnish good practice places for landing and embarking troops, horses, guns, and stores, buoying channels, anchor and torpedo work.

Firing from the boats and gunboats under the same conditions as would obtain in actual warfare.

The officers would benefit by the opportunities—

Of handling and navigating the brigs, gun and torpedo boats;

Of manœuvring at shot and torpedo practice against the moving target ship;

Of gaining experience in the conduct of landing parties;

And of observing the position of the forts with regard to the pilotage of the place, and the best plan of attacking them, or of acting in combination with the shore batteries and torpedo system for the defence of the harbour.

The Gunnery and Torpedo Schools would be absorbed in the Barrack system.

The mastless ironclads, gun and torpedo-boats, would form part of the national defence. They would be always ready for service, and would be utilised for training the Marines as well as the seamen. (While suggesting to place the military drill of the seamen under Marine officer instructors, it would be advisable to place all but the elementary and shore-going gunnery of the Royal Marine Artillery and Light Infantry under naval gunnery officers and instructors.) It is to be regretted that the gun drill of the Royal Artillery and of the Navy are not similar.

All troops, Marines or not, should, when stationed in naval ports, be exercised in embarking and landing from boats and alongside jetties.

The gunboats might be periodically concentrated for the practice of naval tactics, and should visit the small ports to train the reserves, and to practise the officers in pilotage.

Money prizes should be given for pistol-firing, loose play with single-stick, and spring bayonet; and for boat-racing, on the same principle as the gunnery and rifle prize-firing, the winners wearing badges.

As regards sea-going sailing ships for training purposes, it is impossible to make sailors, except by actual practice at sea, in all weathers.



The masted ironclads are seldom at sea under sail. Ships on foreign stations are often kept long periods in harbour for political reasons, and in many cases the climate is unsuitable for drill. The younger men in these ships have, therefore, little opportunity of learning their duty, and are consequently inferior as seamen.

The usual competitive drill of squadrons does not teach the backward men so well as progressive instructional drill in slow time, the reasons for every step being explained, and correct performance of every detail being insisted on.

The sailing ships for training purposes should be frigates, with the proper proportion of officers and petty officers, in order that strict naval discipline and regular man-of-war routine may be maintained.

Being without engines, the expense would be lessened, and more experience would be gained in their handling than in steamers. They should have plenty of practice in going in and out of harbour for the purpose of instructing the officers in pilotage, and in the capabilities of a ship under sail.

Their cruising ground should be in the Atlantic and round our home coasts, avoiding unhealthy places, and not too far to enable them to be quickly recalled in case of war.

Towards the end of their cruise, they should assemble to practise the officers in station-keeping, and the crews at competitive drill.

They should be sufficiently numerous to allow one or two to be detailed for cadets, others for the ordinary seamen, and others, again, to receive the best of the boys from the mercantile training ships at home or in the colonies.

The system might be further extended to foreign stations.

Midshipmen should pass through a long course in the training ship at sea before joining the general service, and should learn their military drills in barracks.

Boys on entering the harbour training ships should first be put through a strict course of squad drill without arms, to ensure discipline and order.

The course would then consist of—

Elementary seamanship (especial care being taken to ensure activity and confidence aloft).

Elementary gunnery (with eye training, which cannot commence too early).

Boating.

Gymnastics (including cutlass exercises).

About eighteen, after a second medical examination to weed out those unfit, they should be sent to a sea-going training frigate, for an advanced and progressive course of instruction in the same subjects.

After a course of about one year in the sea-going training ship they would be sent to barracks to qualify in their military drills, and would probably be fit for drafting in six months.

Ordinary seamen until the age of twenty-two or twenty-three should be under exceptionally strict discipline.

Able seamen should receive an increase to their present pay, and those who have qualified for the position of petty officer, should receive

a further increase of pay and privileges, but should only become petty officers as vacancies occurred, or in case of expanding the Navy in war-time.

When men are sent to prison they forget their drills, and their services are entirely lost for the time. If barracks were established, men undergoing imprisonment in cells attached could be drilled instead of picking oakum; there would also be no chance of their being contaminated by prisoners who have committed other than military offences, and they would be saved the disgrace of being confined in a common prison.

As offences are sometimes committed for the express purpose of obtaining discharge, men discharged from the service as objectionable either without or after imprisonment should be placed under the surveillance of the police in the district where they reside, reporting themselves periodically.

In many cases stoppage or reduction of pay and time during bad conduct, without imprisonment, might be introduced as a punishment with advantage, especially in unhealthy climates, at places where the prison discipline is known to be slack, or where there is a likelihood of the men having to mix with criminals; by this means the services of the man would be retained, he would be kept up to his drill and stations, he would be a constant warning to the ship's company, instead of returning from a slack prison and saying that it was comfortable, as is sometimes the case; the expense, also, would be reduced.

As the principle of stoppage of pay and time for bad conduct is already acted upon in the Navy, necessarily in cases of imprisonment and breaking leave, and optionally when confinement in cells is awarded, it might well be extended.

In small ships where there are no cells, and lying, perhaps, at a place far from any suitable prison, it is in many cases impossible to award an adequate punishment for grave offences.

The case of war time must also be considered.

It would probably conduce to the good discipline of the service if chief and other petty officers of the military branch were placed on an equal footing with those of the civil branch as regards uniform; and to the comfort of the men if the useless and expensive blue jacket and the black hat were abolished; it would also give them more stowage room.

The drill and discipline of the Marines is well known to be admirable. They get hardly any military training while embarked, and even that is for practice, not for instruction, yet they are always efficient; this shows that they have been trained on a sound principle, and that great care and attention are bestowed in barracks, to ensure accuracy even in the smallest details. This is a striking contrast to the military drill of the seamen, who (with the exception of the seaman-gunners) seem to be always at drill, and yet never seem to reach a satisfactory standard.

The Marines are especially valuable from being, as a rule, strong, able-bodied men; whereas many of the trained boys grow up very inferior in physique, their training has been too expensive to permit of their being weeded out. This will be of grave importance in war

time, when continued heavy work has to be done, especially where the complement is small. In small vessels all the boats cannot be manned without stationing Marines at some of the oars, and after a little practice they pull good strong oars, and are quite at home in the boat.

The Marines, as a body, are not quite so active as is desirable. It may be said that any attempt to improve them in this respect would diminish their steadiness, but there are a great many very active and handy men amongst the Marines, and it is a fact that these men are the smartest soldiers in the corps.

Boating, with the exception of hoisting and lowering at sea, can be as well taught in the neighbourhood of the harbour, close to the barracks (of seamen and marines) as anywhere. Boating, firing at a mark with rifles from boats, and the practice of embarking and disembarking quickly and quietly under various circumstances, should form part of the barrack instruction, which should also include a thorough and continued course of gymnastics, the practical working of guns as mounted in various mastless ironclads, firing at a target in a sea-way (from gunboats attached) including careful training in the precautions necessary to prevent the gun taking charge, also the ordinary knots and hitches used at sea (already taught in the Royal Marine Artillery).

It is impossible to have efficient marines without sending them to sea, but it is not necessary, or even desirable, to keep them at sea for long periods, the object should be to pass as many of the men as possible through a sufficiently long course of service on board ship to enable them to learn their duties thoroughly, and then to disembark them to make room for others. So, that while having a large Marine Corps, they would be *bona fide* marines.

A great deal of the popularity of the corps depends, however, on the fact that a marine, while embarked, is provided with free rations, he has many opportunities of saving, and also of earning money as a servant, or working at his trade. It is probable that in future some of our coaling stations, as Hong Kong, Falkland Islands, Vancouver's Island, &c., will be garrisoned to a great extent, if not entirely, by marines, as recommended by Captain Colomb, Royal Marine Artillery; these men should receive free rations as when afloat. Captain J. C. Wilson has most forcibly represented the undue proportion of the "non-combatant," or, rather untrained element in our ships' companies. This may be remedied to a great extent by the employment of marines to fill many of the ratings now held by untrained men; this would increase the number of prizes in the marine service, and make it even more popular than it is.

At present many of the marine servants are unfitted for their position, and have, perhaps, been told off as servants to get rid of them from the ranks. A better plan, and one more to the interest of the corps, would be to select from amongst the smartest, cleanest, and most sober men who have finished their course of training, and who are the least likely to forget what they have learnt, a certain number, who should be carefully trained as officers' servants and cooks, from whom officers applying for their services would be supplied.



Others should be trained for the following ratings:—

Writers (non-commissioned officer and private).

Ship's cook and mate

„ „

Blacksmith and crew

„ „

Armourer and crew

„ „

Plumber and crew

„ „

Painter and crew

„ „

Cooper and crew

„ „

Band-master (?) and band

„ „

Musician (private.)

Sailor

„

Shoemaker

„

Barber

„

Butcher

„

Lamp-trimmer

„

Nearly all these men could make a little money from private jobs—servants and cooks would get private pay in addition to their service wages—a small addition to the pay of some of the ratings would be necessary. Many men would join the corps with the express intention of obtaining these ratings.

Any officer who has been stationed in charge of the flats of an iron-clad, at general or fire quarters, must have felt the difficulty of getting the work done properly by the mixed crowd under his orders, especially when several of them are foreigners.

The employment of foreigners, or even British subjects, who can neither talk or understand English, is not only inconvenient, but dangerous; and the number of untrained men seriously cripples the efficiency of all ships, especially small ones.

It is only required to see a ship, with all her boats away manned and armed, try to work a few guns (to cover her boats) with the remaining hands, to be convinced of the extent of the evil.

With the exception of their want of military training, however, there is no reason to complain of the efficiency of the present artificers.

Rifle fire will be more valuable than ever, for the purpose of picking off the officers of an enemy's ship, or forcing them to keep under cover, for firing through his ports, and resisting torpedo attack. In many ships the small-arm party at general quarters is not sufficiently numerous.

Nothing that the Navy can do on the sea or in defending the coast can justify the absence of an efficient field army to meet the enemy in case of a successful landing.

Gymnastics and military drill should be compulsory in all schools; but if not carried on under strict discipline, it will be worse than useless.

No person should be appointed to a public office who does not hold a certificate of efficiency in elementary military drill and the use of the rifle, from a competent military authority.

It is absolutely necessary that definite martial law should be laid down as regards the discipline of volunteers in war time.



# GREAT BRITAIN'S MARITIME POWER, HOW BEST DEVELOPED, &c.

By Lieut. SYDNEY M. EARDLEY-WILMOT, R.N.

“Magna pericla latent.”

## *Introduction.*

THE subject of the present essay is, perhaps, the most important as affecting the welfare of this country that could be brought forward now or at any future time. But it would seem to be especially applicable at the present moment, when disquieting rumours are rife. And in observing the great changes that have taken place since Great Britain last exercised maritime power, not only have the instruments of force themselves undergone transformation, but the conditions have so altered under which maritime warfare is carried on, that it behoves us to consider whether our maritime power is likely, or not, to suffer by those innovations from ancient principles which enabled us to acquire that naval supremacy conceded by the world, and which we should at all hazards retain.

In fact, a brief review of this portion of our subject is necessary before entering into the several units of which the whole question is composed, for in treating of most it will be found to have an intimate bearing upon the point under consideration. In what, then, consists maritime power? A brief and concise answer could be given by quoting the four heads upon which we are asked to dilate in this essay. But it is possible that this power may in some measure be weakened for the following reasons:—

1st. If the fighting ships of one nation greatly preponderate over those of another, as was the case in the Franco-German war, when the French Fleet hovered vainly about the German coast, while the enemy remained snugly in port. There was not even a blockade, for at night the French went out to sea for fear of torpedo boats.

2nd. The protection of commerce would appear to have lost much of its importance under the new principle that the neutral flag covers enemy's goods, with the exception of contraband of war.

3rd. The value of a supplemental force is weakened for the same reason, and also from the concession which precludes us from utilising the assistance that private vessels could afford in time of war.

4th. Colonial and home defence is affected to a certain extent by the same conditions, for the number of our Colonies is such that we should look to them to contribute in a measure to their own defence, and it is obvious that to take away from them the right to equip supplemental vessels would be neither politic nor just.

It would be as well, therefore, to give a few reasons why we should not limit our means to carry on, when required, the most efficient warfare, whether for offensive or defensive purposes, nor do I think it can be considered foreign to our subject.

Nobody will deny that on the maritime power of Great Britain mainly depends the safety of the country, and this has been proved on more than one occasion. Neither can it be viewed solely as a defensive arm, for without its aid no offensive measures can be carried out; a fact equally indisputable.

Its functions in peace time are almost as important, for they extend to all seas and to all countries. But as under the present condition of that system by which nations seek to obtain justice, real or imaginary, from each other, all should be prepared for war, it is necessary to consider that view, especially in the development of our naval strength.

It is useless to ignore the fact that wars, though not so frequent now as heretofore, do take place; and however sad it may be to contemplate one nation engaged in strife with another, certain it is that the evil is not unalloyed with good, and we may be sure that in the civilisation of the world, war has been an important factor.

Recognising its existence, then, and till some other method of settling international disputes has become universal, it stands to reason that our policy should be to make this as effectual as possible. The primary object of war is to reduce an enemy to submission; and though there are certain limits to the means employed, they have generally only extended to that portion of the community which, among all civilised nations, has an admitted claim to humanity. If warfare is to be restricted to a section of the community, we not only prolong the operation, but also take away from some nations their chief power, so that it is difficult to realise their voluntarily submitting to such regulations. For instance, Great Britain, from reasons that all admit, cannot have a large standing army, for the system by which they are obtained on the Continent is foreign to all our national ideas. But from the earliest period of our history, this country has been essentially maritime. Inherent to us is a proclivity for the sea, resulting chiefly from our being an island, which has given us the largest sea-faring population in the world, so that to this arm we have always looked to counterbalance the want of military strength. Our object, then, in war should be to utilise this power to the fullest extent by inflicting with it as much injury to the enemy as possible. The question then arises, how is this best effected?

I think that an examination of certain facts will show that, to cripple the commercial intercourse of a hostile power will conduce

largely to that result. Nations attain their power chiefly through commerce. It not only gives them the sinews of war, but under adversity enables them rapidly to recover strength. No more notable instance of this, than that of France after her late war, has occurred in modern times, whereas had Germany been able to cripple her commerce, the financial state of the former afterwards, would have been far different. Germany has seen her mistake, and since that time has laid the foundation of a powerful maritime force.

But it has been argued that England, herself possessing such a vast commerce, must needs be the chief sufferer in such an eventuality. Granted, were our protective power not in equal ratio. But it must be allowed that the loss of a small portion would not be felt, while with another Power, a similar amount would seriously cripple her resources. Let us, on the other hand, observe the effect produced by allowing commerce to pass free under a neutral flag. Take the case of a great military Power, having little or no naval strength, at war with a nation strong at sea but weak on land. The former simply puts all his commerce in neutral ships, and uses his military strength to the greatest advantage. The latter, finding his vocation gone, would have to content himself with a policy of masterly inactivity, and be reduced to using his great source of power as a means of defence only. Who would blame him, however, when existence was at stake, for breaking through those restrictions; for self-preservation is the first law of nature? Again, why should there be such a dislike to the principle of privateering among Continental nations, while, on the other hand, we find the United States and this country desiring to retain it? Simply because both know they are peculiarly adapted to employ such a weapon with effect, and it enables them to utilise the patriotism of all who cannot otherwise assist. Those nations, however, who have advocated the abolition of privateers, would find it a matter of considerable difficulty to supplement their regular strength by such auxiliaries. Hence their opposition!

In England, however, there exists great misapprehension on the subject of private vessels fitted out for service against the enemy. Their use is associated with irregularities and cruelty. They are accounted the Bashi Bazouks of maritime warfare. But, as we may put aside many of the reports concerning the cruelty of the latter as unfounded, so we have reason to know that the proceedings of privateers have certainly not been accompanied by extraneous deeds of cruelty.

We may ask, moreover, what would be the *status* of a vessel fitted out in the Colonies, and manned by a crew unconnected with the Navy? To all intents and purposes she would be a privateer; but could we debar Australia or any other distant possession from taking into their own hands defensive measures in order to supplement our regular force? Assuredly not; so we must recognise in a measure private efforts; and if the seizure of property is not quite so honourable as sending a vessel to the bottom with a torpedo, it must be conceded that the operation is less cruel.

Before leaving this subject, let us not forget that we have a large number of merchant steamers, many steam yachts, and other private



vessels, which are available for defence if not for offence; that among the gentry are many of wealth and patriotism sufficient to fit out a vessel to act in any way required; that in the regular Navy we have not sufficient officers and men to man more than a few of such auxiliary vessels, and our reserves would be all required for other purposes. Therefore, I do not think that on an emergency we should scruple to avail ourselves of such outside assistance; and if we do not, except in time of need, it would be as well to retain the power. I am of an opinion that recent events have tended to revive this feeling throughout Europe, and a few months may see a great change in this respect. With these few preliminary remarks, I will pass on to the several heads of the present essay, and at once come to—

### *Fighting Ships.*

Now I must confess that this point has caused me great perplexity, for so many definitions have been given of what should constitute a fighting ship, and our own Navy presents such a diversity of types, that one may well pause before venturing to add to the varieties, by advocating something different even to all. It is, however, in the disagreement of so many able men that courage is found to suggest certain alterations, more in detail than general principle, for no professional man can dispute that the majority of our ships fulfil most of the conditions necessary for an efficient fighting man-of-war. It has been my lot to visit many foreign vessels, and to form a fair opinion as to their capabilities, but, have never returned to a comparison with our own, without finding cause for satisfaction. Therefore it has always seemed to me manifestly unfair only to point out, as some seem to take a delight in doing, the defects of vessels constructed at a time when the world was ignorant as to how far iron would be needed in ship-building, for none could then foretell the advance guns would make, even as it would be impossible to say that we have now reached the limiting size of them for use on board ship. Our ideas, therefore, as to the best type of fighting ship have altered materially from time to time, and must continue to sustain modification as we develop new schemes of destruction; and I am inclined to believe we have yet to construct a vessel which shall combine in a greater degree those conditions that the most experienced and ablest naval men consider indispensable. One conclusion seems certain, that as with all concerns in this world, we can only approach perfection through a compromise, and that those matters which are deemed essential to the welfare of mankind are nothing more or less; so we must be satisfied with a ship that cannot be otherwise than a compromise.

The point of disagreement is in what manner it shall be attained. We cannot combine in a perfect manner, speed, turning power, heavy armament, complete armour protection, ability to keep the sea for a lengthened period—all, in fact, of those attributes which divided opinion has deemed necessary; and the question is, what shall be abandoned and what retained? Now, as regards a fighting ship, I consider the following points essential:—

1st. Speed.



- 2nd. Handiness in turning.
- 3rd. Heavy armament.
- 4th. Armour protection for guns and vital parts.
- 5th. Stowage for fuel.
- 6th. To offer a small mark for artillery fire.
- 7th. To be built in numerous compartments.
- 8th. Moderate in cost.

We will take each of these points in order.

First, as regards speed. It must be acknowledged by every one that this is an important quality for a fighting ship, as without a certain speed a vessel is practically helpless. I would consider 14 knots the lowest rate, and with such a provision she could not find herself placed at a disadvantage, unless in comparison with some vessel in which speed had been the first and only desideratum.

Second, the turning power of ships, I consider of equal importance. Possessing great handiness in movement will enable a ship to manœuvre with facility, will conduce to her safety in ordinary navigation, and enable her to utilise the ram or avoid such an attack with greater certainty of success. Thus it is impossible to over-estimate the importance of this point, and to secure it, we should be prepared to sacrifice in other directions.

Third. Heavy armament.—Not a few are of an opinion that a number of moderate sized guns are superior to a less number of greater weight. This is perhaps on the assumption that a large percentage of shots will be thrown away in the heat of action; and no doubt where the fire is left in the hands of men whose vision is limited by the confines of a small port, and whose training, however good, has not led them to calculate how minute an error at the moment of firing will affect the result, we cannot hope to see every shot strike the object. But if, on the other hand, we concede that firing by broadside will in the future be the usual mode of procedure in a naval action against armoured vessels, we may expect that this defect will be greatly overcome. The employment of electricity also will decrease the percentage of waste shots immensely, because with it we obtain—

1. An instantaneous delivery of fire.
2. If guns are correctly laid, no shot is thrown away.
3. Direct communication between the guns and officers in command.

The first removes that necessary calculation of time that must be allowed in communicating the order to fire to the guns.

In the second we prevent any gun being fired prematurely, for none are placed in the electric circuit until accurately laid by the orders given.

In the third we do away with a great defect arising from intermediate orders that may be imperfectly understood, or erroneously communicated.

In fact, against an armoured ship, only broadside firing could be used with effect for several reasons, of which the following are a few :—

1. Because of the greater total effect of a number of projectiles

striking at the same instant, compared to a like number striking at intervals.

2. Because between decks, the enemy would be visible for such a brief period, owing to rapidity of movement.

3. Because smoke between decks would impede the vision.

4. Because the most advantageous bearing, and part to attack, must be decided by some one who has knowledge on that point.

5. Because opportunities for firing will only occur at intervals.

Therefore, I am of an opinion that the weight of a broadside, independent of the number of guns, is the chief point, and that the destruction caused by cannon is proportionate to weight and diameter of shot; also that a few heavy guns are preferable to a large number of lighter weight. I agree with Monsieur Duhamel, who says, "Il est certain que ce sont toujours les gros canons qui sont les plus avantageux dans un combat, et ainsi il est préférable de mettre sur un vaisseau un petit nombre de gros canons qu'un plus grand nombre de petits."

Fourth. Armour protection for guns and vital parts.—I must confess that on this point my own opinion is at variance with a great number of distinguished Officers, whom I find advocating the total abolition of armour in the vicinity of the guns, in order that it may be put elsewhere. Now, it seems to me that, however grand may sound the theory of making a ship unsinkable, in practice it will be found impossible. Guns, rams, and torpedoes must always carry a margin of power over the defence of a ship which will prevent our making her unsinkable by means of armour-plating. Besides, consider what we risk by stripping the guns and crews of all protection. The terrible effects of shell fire are well known, and in a short time we might have every gun disabled and the crews decimated. But, say the advocates of this principle, then she can act as a ram. I think this is relying too much upon an auxiliary weapon, and three things are needed to use it efficiently—great speed, handiness in movement, and more than ordinary skill to bring it to a successful issue. A chance shot might create confusion and entail failure, and the frustrating efforts of the enemy must be taken into account.

A fair illustration of the advantages of armoured protection for guns as well of as a heavy armament, is found in the action of the "Shah" and "Huascar." The former, by superior gunnery, struck the latter frequently, but did no serious damage, because she had not sufficiently heavy guns to penetrate the armour. But if the "Huascar" had made similar shooting, it is fearful to think of the consequences to the "Shah's" unprotected sides. Fortunately she was not hulled by a single shot! One fact, however, is significant, that a small monitor with a Peruvian crew kept two English ships at bay for a considerable period, and eventually escaped!

But, again, it seems to me that an important point has been lost sight of in discussing this question, and it is that we can make a ship too unsinkable, if the paradox may be admitted. That may seem impossible to many, but my meaning is this, that if we take away all armour from guns and their crews, to place it about the water-line and

machinery, our ship may not be sunk by a heavy and well-directed fire, but her power of offence will be gone, and to avoid capture, we must either sink her ourselves or run.<sup>1</sup> With a change in the weapons of destruction has come a change in the principle of their use. Disabling with a view to submission was the former end of a naval action, now it seems we are not satisfied without annihilation. I think, therefore, the wisest course is to retain protection for guns and gunners, sufficient at least to keep out common shell, and not seek to make a vessel perfectly unsinkable, if it is a choice of robbing Peter to pay Paul.

Fifth. Stowage for fuel.—To obtain this, and for other reasons, it will be necessary to do away with masts, and at once I state my opinion, that under present circumstances for a purely fighting ship much is gained by their abolition. We have reduced the number, but we have yet to learn what sailing qualities will be exhibited by the “*Temeraire*” with her brig-rig. She is 282 feet long and 62 feet broad, which is in the proportion of nearly 4·5 to 1, and I think no other ship afloat has so small a ratio of length to breadth. Therefore great power will be required to propel her through the water, and her spread of canvas will not have much effect. Steaming, however, against a head-wind, her heavy spars will offer a great resistance, and if economy should be the only point, I am sure there would be a saving in the long run by having no masts. Another defect they involve, is sadly to circumscribe the all-round fire of the barbette guns, for the rigging on each side covers a large angle of training. That would have to be sacrificed in action. Masts, also, with the rigging, are liable to hamper the movements, and increase the size of mark offered to the enemy’s fire.

As regards the actual quantity of coal carried, it will depend upon the size of ship; but there should be the ability, say, of steaming from England to Malta at a sustained speed of ten knots an hour. There are but few ships in the British Navy that can do this, and they probably are mastless.

Sixth. To offer a small mark for artillery fire.—It is hardly necessary to dilate upon the advantage of this, but all who have been at sea with a squadron composed of different types of ships cannot fail to have remarked how small a mark is presented by a low ship without masts, even when tolerably close, compared with the high freeboard-masted vessels. That always struck me last year when our squadron exercised at fleet evolutions during a seven months’ stay in Besika Bay. Be it remembered also that a very small error in elevation will affect the result much more in the one case than in the other, and this point applies with greater force at night, when the loom of one would be insignificant compared to that of the other.

Seventh. To be built in numerous compartments.—A great authority has said, and experience has demonstrated, that “it is idle to attempt to form the bottom of a ship strong enough to resist a fair blow from a powerful torpedo. The extent that can be done is to keep the disabled ship afloat after she has received such a blow.” That could be effected under certain circumstances depending upon size of torpedo employed;

<sup>1</sup> Nearly all our naval victories have been won by disabling guns and gunners, and so placing the ship *hors de combat*.



but we may reasonably doubt the possibility of saving a ship under whose bottom, and directly beneath the machinery, a large mine had exploded. In dealing, however, with the smaller nature of locomotive torpedo it should be quite feasible to prevent total disablement by a judicious use of the cellular system, which prevails now in the construction of all our iron ships. The only question seems to be in the disposition of the compartments, and the difficulty of subdividing the space for machinery and boilers. With two sets of engines and boilers we may decrease the space, but the fewer doors the better, for with each comes a smaller margin of assurance that all are in working order. In fact, I would advocate having, as far as possible, the doors or openings above the water-line, which, if somewhat inconvenient, would tend to safety.

Last, but not least, comes the question of cost. Now it is evident that one ship will not make a fleet, however powerful she may be, and that, moreover, we cannot afford to spend a million upon a vessel that may be disabled by a single shot or torpedo. The estimated cost of engines and hull of the "Inflexible" is stated to be £521,750; so that by the time she is finally completed and fully equipped for sea, it is reasonable to suppose that nearly a million will have been expended upon her! For that sum we should be able to produce two, if not three, vessels which will together form a more powerful force, carry more chances of self-preservation, and would inevitably, if pitted against the larger vessel, sink her.

Having thus enumerated the points which we should endeavour to attain, I will strive to produce a ship that appears to me likely to combine them in the most advantageous manner. This ship should be somewhat similar to the "Ajax" and "Agamemnon," with certain alterations, but more approaching that type than any other vessel, either afloat or in course of construction. She should represent extreme breadth, compatible with speed and seaworthy qualities. A screw iron turret-ship armour-plated. Her length to be 250 feet, and extreme breadth 100 feet.<sup>1</sup> Passing over for the moment the question of speed, we shall here obtain most of the points already laid down as desirable. Undoubtedly such a vessel would possess wonderful handiness, with ability to turn in a very small circle. The increased breadth would allow heavy guns and armour to be carried with a comparatively small draught of water. She should have no masts, but all possible space utilised for fuel. In lieu of placing the turrets forward and aft as in the "Devastation," or in echelon as in the "Inflexible," I would place one on each beam, by which arrangement it follows that the best fighting position is end-on, whereby we utilise our offensive powers to the greatest advantage, but show the smallest point to the enemy. In this position, the ram can be used or avoided with facility; the Whitehead torpedo would have less chance of hitting; bow and stern fire are equal. Should an enemy deliver his broadside when abeam, one turret is protected by the other, and therefore the size of target is decreased. Although the breadth is so great, few shots can take effect from ahead

<sup>1</sup> These figures are not meant to be perfectly arbitrary, as a better result might be obtained by such a ratio as 270 : 90, though some advantages would be reduced.



because they will strike either bow at such an angle that they will not bite, for we know the limiting angle is about  $35^{\circ}$ . The same applies to the turrets, which must be struck fair to sustain damage. To counter-balance these advantages it must not be forgotten that a plunging or vertical fire would have more effect upon such a vessel, and that docking difficulties would present themselves; but it seems to me that the advantages are so great in comparison, that they outweigh the objections.

The question now remains, can we obtain with such a type the speed considered indispensable? I am of opinion that this is quite possible, for, first of all, let us consider upon what depends the speed of ships, or rather what tends to retard the forward motion. We may say generally, without going deeply into the question, that the total resistance to vessels passing through the water is made up of two constituents, one caused by the pressure exerted by the water against the ship, and the other due to the friction of the water on the sides and bottom of the ship. As regards the first, water being practically incompressible, what the ship displaces must find an escape, and the direction of the surface offering least resistance, it will take that route and so cause a wave or elevation at the bow which increases the resistance. This displaced water, however, will travel towards the stern, filling up the hollow left by the vessel, and assisting to propel her forward. It is clear then that the broader a vessel is, the more water must be displaced to allow her to pass, and therefore greater force is required to propel her forward. How then can we obtain this increased force or power? I do not myself see any other method than by increasing the number of propellers. Two things limit the power we can put into a ship, viz., weight and size of propeller. We have doubled the original number with satisfactory results, for the advantages of two screws over a single one are now conceded by all, and similarly a three or four-bladed screw gives greater speed than one with two blades. It seems to me feasible to further increase the number of propellers, and instead of one, say of ten feet diameter, requiring 2,000 horse-power, by having *four* of the same diameter we could utilise 8,000 horse-power. I have read some remarks by Mr. Griffiths which seem to me worthy of consideration. He states that by placing the screws in tunnels and taking the water from underneath instead of from the stern of the ship, he obtained the same speed from a model 3 ft. 2 in. long and 1 ft. 2 in. broad as he did from one 5 ft. long and  $7\frac{1}{2}$  in. broad.

In this case, form-resistance has been reduced to a minimum, and it would be worth while to extend these experiments. As regards the locality of additional propellers, I do not see why, with the type of ship here brought forward, we could not have two at each end as, I think, has been advocated by Mr. Griffiths for the following reason: that the action of the screw at the stern must tend to retard the vessel by acting on the water coming from forward, which instead of being allowed to propel the ship forward is thrust violently back, whereas could the action take place forward water would be taken from the place required and then sent back to fill the vacuity or be utilised by

other propellers. If this reasoning be correct, screws before the beam would give a better result than when placed abaft, and if combined, we should obtain a marked difference in speed.

Next, as regards friction of water on sides and bottoms of vessels, and this, I believe, is the cause of the greatest retardation of ships. Therefore any expedient for diminishing resistance in this respect will be followed by an increased speed. It is, however, extremely difficult to make the bottom of any vessel perfectly smooth; so many considerations come into play. Some surfaces are, of course, smoother than others, therefore less friction is produced, and consequently less resistance. But this friction is not a constant quantity because it increases with the speed. I believe Beaufoy found by experiment with planks that the friction per square foot was at one nautical mile per hour .014 lbs., at two .0472 lbs., at three .0948 lbs., at four .153 lbs., and at eight .5008 lbs. Therefore it is evident that if the friction can be reduced, a considerable gain in speed will follow. I would suggest that experiments should be made with glass to ascertain whether it cannot be utilised for coating ships bottoms, either by plates or a kind of veneer of that material, which would enormously reduce skin friction and that fouling which is now so prevalent. Glass plates can be made of any shape, but some difficulty might be encountered in the glass and iron having different co-efficients of expansion. The co-efficient of superficial expansion of glass for 1° between 0° and 100° centigrade is .000017226, that of wrought iron is .000024408. I am not in a position to state whether glass would have sufficient elasticity to nullify this difference, but should imagine so, unless subjected to the extremes of heat and cold. With glass, no chemical action could take place for we put a non-conductor in contact with the iron; moreover, any deposit could be readily removed. I am not aware whether any experiments have been made in this direction, but could this material be successfully employed, a marked difference in speed would, I am sure, be observed.

In advocating a special type of vessel as best adapted for fighting purposes, I do not mean to preclude all others, because it is evident we must have different natures, according to the part of the world in which they may be needed. I would retain the above particular class for the Mediterranean and Channel, while, for distant seas, such vessels as the "Hercules" and "Triumph" are admirably adapted to sustain the national credit against any enemy they may there encounter. But I cannot admit any unarmoured vessel to be an efficient fighting ship, even if carrying heavy guns, for she may be crippled or disabled by well-directed fire from moderate-sized guns. The advantage of plating was shown in the action between the "Shah" and "Huascar," and remains to us a lesson not lightly to be forgotten. Unarmoured vessels are adapted for the protection of commerce and for the occasions of peace in showing the flag in all parts of the world. Let us not imagine, however, that they can engage successfully any ironclad which should be handled and fought with but a small degree of skill and courage, for if so, we may encounter chagrin and surprise in finding that our naval supremacy is not equal to the occasion. The hull of the "Shannon" may be unsinkable, but I firmly believe, with

a worthy antagonist, she would in a short time have most of her guns disabled and the majority of their crew *hors de combat*. It is hardly necessary to state that her guns on the upper deck are entirely unprotected, and that such a weapon as the Gatling gun, or even ordinary small arms, would have a definite work to perform, which would be to decimate the gunners. Another point which struck me as a defect in this ship is common to most of our vessels, and that is the position of the conning-tower. In the "Shannon" it is just abaft the foremast, which cuts off, therefore, the most important look-out of all, that of right ahead; whereas, if placed on one side, a less important bearing would have been obscured. It has always seemed to me best to have a single-armoured conning-tower in a commanding position rather than two rifle-proof sentry-boxes, one on each side. In action, the captain should take a certain locality and adhere to it; he cannot be dodging about from one side to the other. His eye should never leave the enemy, and at hand, should be communication with helm, engines, and guns. No worse place for a single tower can be than that amidships, unless before everything; and I have heard captains remark they would not think of boxing themselves up there, but would take to the bridge, building themselves a protection of hammocks against small-arm fire, in order to obtain a good all-round view. There seems to be an impression that a shot would strike the tower more readily than any other place, and that moving about carries with it a certain amount of protection. But such an idea is as absurd as that by moving in a shower of rain you may in a measure elude the drops.

This part of the subject would not be complete without a few words regarding the ram as a weapon, and also torpedoes. Respecting the latter, it is first necessary to put aside all feeling of sentiment as to their use, because all nations have adopted them. It is a more economical method of protecting coasts than with a large fleet, and helps to counterbalance any predominance of power one nation may have over another at sea. Skilfully-handled torpedoes are effective weapons, and for defensive purposes superior, under certain conditions, to all others. They may be defined generally as any mass of explosive material exploded under water, but they vary greatly in construction and operation. The Whitehead, as an offensive torpedo, stands above all others for several reasons, among which are:—

1. Its range of usefulness is great in comparison.
2. It has locomotion in itself.
3. Rapidity of movement.
4. Ability to retain a uniform depth and direction.
5. Its approach is unheralded by outward signs.

Under such circumstances, it simply takes the form of a submarine gun, with a shorter range of efficiency than the ordinary gun, but with the power, if successfully applied, of doing infinitely more damage. I would not, therefore, advocate the abolition of ships carrying guns for a fleet of torpedo-boats armed with this special weapon, but that the two should act in combination. Every large



ship should carry this weapon, and a boat sufficiently large to be employed on torpedo-service, having a fair speed and seaworthy qualities. An increase in the size of the ordinary ship's launch would secure this. In action upon the open sea any opportunity of firing the Whitehead torpedo should be seized, but it must be remembered that various causes will co-operate to limit its chance of success except at close ranges.

As for the reasons laid down, I would not give torpedoes undue pre-eminence over guns, so also I would not consider it desirable to build vessels for ramming alone. The ram is an important weapon within the limits of its range, but many conditions come into play before its successful operation can be assured. Such would need, in a vessel attempting ramming only—

1. Great speed.
2. Handiness in movement.
3. Skill and nerve of a high order.
4. Incapacity on the part of the enemy.

Furthermore, the effect of a blow from a ram will be less than of a torpedo explosion, and I am inclined to believe the idea of the former is much exaggerated. It is probable that an efficient water-tight compartment system will prevent any ship being sunk in this manner. In concluding this part of the subject I would state, then, my opinion that the maritime power of Great Britain would be best developed, as regards fighting-ships:—

1st. By having a certain number of iron or steel turret-ships, armour-plated, of a length about 250 feet, and extreme breadth about 100 feet.

2. That they must be capable of a speed of 14 knots per hour, to be attained by increasing the number of propellers, and by reducing the friction on the bottom by introducing a smoother surface.

3. That they shall carry a turret on each beam, thus having a perfect bow and stern fire.

4. That they shall be mastless.

This type to be for service in the Channel and Mediterranean.

For service in distant parts, fighting vessels should be masted iron-clads, with a fair sailing capacity, carrying heavy guns, protected by armour sufficient to keep out common shell, and having an armoured belt right round at the water-line. Such vessels as the "Hercules" and "Triumph" correspond to this description, and are well adapted for any part of the world. I would here point out the necessity for such a vessel on a station like the Pacific, having spent three years there in an ironclad, and travelled during that period 30,000 miles under sail alone. The average expenditure of coal was only 1,600 tons per annum, and yet all the functions of a British man-of-war on a foreign station were efficiently performed. What the result would have been had such a vessel met the "Huascar" must be left to conjecture.

I shall now pass on to the next portion of this essay, which deals with the protection of commerce.



*Protection of Commerce.*

It is hardly necessary here to point out the direct bearing commerce has upon modern warfare. It simply represents national wealth, strength, and rapid recovery from disaster. To supply other nations with those articles not to be obtained in their own country, and receive from them what does not abound or exist in our own, has formed that large commercial marine which has produced the vast wealth of this country. All nations are rich or otherwise by the measurement of their commerce, and true power consists not in men numerically, but in money and national credit. Many causes have conduced to give Great Britain a greater commerce than any other nation. Her natural resources are superior; that is to say, in this country more useful substances are to be found than in any other; so the world comes to us to buy. Possessing the materials and skilled labour, we can build better and cheaper vessels to transport them. We find, consequently, not only British vessels carrying our articles of commerce, but also those of every other nation. The most important item that we receive from abroad is that of food. The amount of grain and meat produced in this country is insufficient for our numbers, so we are largely dependent upon a foreign market. Our supply, however, could never be stopped by a war with any one country unless we lost command of the seas, for abundance could be obtained from other parts. An adequate protection for our commerce, then, is an absolute necessity, and, if that be granted, it follows that we shall derive great advantage by impeding that of any nation with whom we are at war, instead of allowing them to increase their wealth, and so prolong the struggle. At present we are in a state of uncertainty as to what constitutes contraband of war, but lately I have heard it broadly defined as anything which may assist a nation in warfare. Food is certainly an important item, while coal is often a more useful auxiliary than gunpowder. An impression seems growing that the time has arrived to consider everything contraband that belongs to an enemy; this, at any rate, would prevent confusion now, and hereafter perhaps disastrous arbitration. We have nothing to fear from such a step, for England possesses such a reserve of power and vitality in a maritime aspect, that only an impossible combination could stop our vessels from carrying our trade to all parts of the world.

In treating of vessels of war for the protection of our commerce it is difficult to determine whether to look at the question purely from that point of view or as to what type is best adapted for various purposes, of which the protection of commerce is but one. There has been a tendency to imagine a vessel can combine every attribute, and disappointment has resulted from the failure of a ship of considerable pretension to successfully compete with another which was not intended for a like purpose. Under no circumstances could the "Shah" be considered a fighting ship of either the first or second class; and then we come to the question as to whether she is the best type for a cruiser. Now I am of opinion that unarmoured vessels do form an essential part of our maritime strength, and that we may with

advantage increase their number. Their functions should be to protect our commerce in time of war and to destroy that of the enemy. In time of peace they would constitute our training establishments, and be distributed over the different stations. To efficiently carry out such a purpose we require a large number, and in time of war we should have to supplement them by utilizing merchant steamers that could be most readily adapted to carry two or three guns and the Whitehead torpedo.

For an ordinary cruiser we require—

1. Speed.
2. Moderate size.
3. Coal carrying capacity.
4. Moderation in cost.
5. Ability to carry one or two heavy guns.

The only question in my mind is where to draw the line as to size; whether to take such a vessel as the "Iris," which will possess most of the qualifications laid down as the standard, or a smaller type. My opinion inclines to the latter in view of the numbers required, and under the impression that in the event of war with certain Powers, a great number of small ships would be hastily equipped and sent out to prey upon our commerce. We have seen the damage one "Alabama" could inflict, and it is against a similar type I would chiefly provide. I should advocate for this purpose vessels about 200 feet long and 35 feet beam, of about 1,800 tons burden, and 3,000 horse power. They should be built of steel, and have a mixed armament of light and heavy guns. Their spars should be light, and spread of canvas in proportion. There is no occasion in these days for a ship to be a fast sailer. Sail-power is only used for economy and training purposes. All we require is an auxiliary to assist us from port to port in peacetime. In war-time, however, steam would always be up, and heavy spars would then be only an incumbrance. Steel has several advantages over iron for such a ship, being lightest for an equal strength, and the skin friction should be less, owing to its smoother surface. These vessels should carry the Whitehead torpedo, which, under certain circumstances, can be employed with terrible effect, especially by any ship commanding great speed. Fifteen and a-half knots should be realized by this type, which is sufficient for a cruiser; nor do I think there would be difficulty in obtaining this speed. The draught of water should be about 16 feet forward, and 19 feet aft, and I would sacrifice no advantage in steam power to obtain additional sailing capacity. If twin screws will give an increased speed, have them, and relinquish the idea of hoisting your screw. Steam is now the motive power, and until it is superseded by another, everything should be subordinate to it. Perhaps the chief advantage of the type here advocated for the protection of commerce would be in economy, for roughly speaking they would cost half the price of the "Iris," and at the same time possess most of her qualifications. By the diminished length we should lose slightly in speed and stowage, but I think we gain in comparison. Much has been spoken and written about belted cruisers, but I have never yet been able to determine whether

they are to be considered as fighting ships or simply cruisers. The only one I have had an opportunity of inspecting is the "Shannon," and she struck me as being a most unsatisfactory vessel, for reasons already given. The "Nelson" and "Northampton" are an improvement on the "Shannon," but, if I am not mistaken, they are considered in the light of *bona fide* fighting ships, and by the Chief Constructor of the Navy as superior to such a vessel as the "Temeraire." In this opinion I cannot coincide. The latter will throw a broadside of 2,400 lbs.; the "Northampton" 1,800 lbs. Their length, breadth, and speed will be about the same. The "Temeraire" has not only a complete armoured belt, but also armoured protection for guns. With the exception of the foremost and after guns, those of the "Northampton" are unprotected by armour, and her belt is not extended to the bow and stern. The "Temeraire" has a bow-fire of three 11-inch 25-ton guns, the "Northampton" only two 10-inch 18-ton guns. As fighting ships, therefore, there is little comparison, and for the protection of commerce such vessels are unsuited. They have not sufficient speed, cannot carry enough fuel, and cost too much money. That such vessels as the "Shannon," and "Northampton," are adapted for a station like the Pacific may be admitted; whether they would have forced the "Huascar" to haul down her colours is an open question, but every probability would be in favour of that result. As regards supplementing our regular cruisers by merchant steamers equipped for the protection of commerce, I am of an opinion that it might be done to a certain extent, but such vessels could only carry light guns, though the addition of a Whitehead torpedo would give them a formidable character. They would be needed in the event of an enemy making use of a similar weapon, and from such a number for selection, we should obtain vessels that could be easily extemporised into efficient cruisers, trusting to their heels when attacked by a more powerful foe. To depend entirely upon such a source would appear to me a short-sighted policy, for if so at the beginning of a war, we should be practically helpless. Rather let us increase the number of those vessels which may combine, in the best manner, qualifications essential to this duty, for on them mainly depends the maintenance of that skill on the sea which more than anything else has given us a just title of efficiency. The necessity of training our young seamen must not be forgotten, and at present this is not properly ensured. A more systematic course of training for officers and men is much needed. I should like to see fewer ordinary seamen sent to our armoured vessels, especially the mastless turret-ships, but all first made to undergo a commission in one of our unarmoured cruisers, where they would learn seamanship in all its branches. If the same course were followed with the Officers, it would be highly beneficial, for if as Sub-Lieutenant, one year at least, were spent in one of these ships, and then two years when first made Lieutenant, we should not have that inequality of experience and efficiency which now exists.

The latest effort to produce a cruiser of great speed has resulted in the "Iris," but she is too costly, for we find that ten corvettes of what



is called the "Gem" class cost little more than four of the "Iris" type. Whether the latter will be cruisers or despatch vessels remains to be seen, but a great objection attached to the "Iris" is the height of her funnels, which will be very injurious to masts, sails, &c., if steaming for any period. I think, however, she would be more generally useful if barque-rigged, at any rate less costly in peace time, and the power would always remain of laying aside anything that might be considered superfluous in time of war.

*Naval Volunteer or Supplemental Force.*

The question of providing an adequate reserve of seamen in the event of war has been brought forward a great number of times but never received a satisfactory answer, and at present a solution of the problem seems as far off as ever. Considering the population of the United Kingdom, and what the proportion of those engaged in seafaring pursuits bears to the whole, it is astonishing we could not have obtained a better result than what is now afforded by the Royal Naval Reserve. But before creating a reserve we should have a thoroughly efficient standing Navy, and at present there is a dearth of trained and experienced seamen, which would be greatly felt at the beginning of a war. This results from two causes. 1st, Because the supply of men is kept up entirely by the entry of boys. 2nd, Because they engage to serve for ten years, and then a large proportion leave the Navy. As regards the entry of boys, I think that this method of obtaining men is the only one that can be relied upon, and gives a good result in many respects; but there are some great defects which should be removed at all hazards. One is the time these boys are kept in guardships before being sent to sea. A lengthened stay in a harbour-ship at Portsmouth or Plymouth cannot add much to their nautical acquirements, and must be attended with evil consequences, both morally and physically. It is not difficult to understand, with a great number of boys, what an effect a few bad examples will have on the rest; and all Officers who have had experience of these ships bear witness to considerable depravity on board. The shorter time they are there the better, and I consider that six months in a harbour training ship is quite sufficient. What we really want is more of these sea training ships, like the "Eurydice," and more brigs. We could then also employ many Officers now necessarily on half-pay, and so be training them at the same time. At present in the Mediterranean we have such a vessel in the "Cruiser," and actually send ordinary seamen to her to be taught what should have been learnt before. This is simply because they have been imperfectly trained, and no wonder when we consider how their time has been spent. Take the case of a boy from the west of England: he perhaps goes on board the "Dædalus" at Bristol to join the Navy, and, if passing the test, is sent to the "Implacable" at Plymouth. Here he remains eighteen months or probably two years even, waiting to be drafted to a seagoing ship; so he is eighteen before going to sea, and is rated an ordinary seaman shortly afterwards. Very ordinary is the majority, and I have seen most miserable specimens comprising the greater part of a ship's company. When Russian

officers visited our fleet in Besika Bay, on the occasion of the Duchess of Edinburgh passing through in the "Livadia," they noticed the youthfulness of our crews, and after seeing their men one is struck with the contrast. But probably the chief reason for this is to be found in the painful fact that our men leave the Navy just as they have attained their prime of usefulness. Under the continuous service system men engage to serve for ten years, on the completion of which they will be about 28 years of age. Here we have a valuable acquisition, a thoroughly trained man and in the prime of life, whom we should at all hazards retain in some way or the other. But until very lately we offered him no inducement to remain, and consequently a large percentage leave as soon as their time is up, knowing they can get better wages elsewhere. But what a number of good men we should retain were we to offer as an inducement sixpence a day, in addition to rate of pay at the time, for men to re-engage for a further period of ten years. Roughly sixpence a day is nine pounds a-year. A good man is well worth that, and a thousand would cause an extra expenditure annually of £9,000. Of course it would be optional whether any man should have this inducement held out to him, and knowing that would be an incentive to exertion and good behaviour. The want of good petty officers would not be felt as it is now, nor should we see mere boys given those ratings in default of more experienced men to fill them.

And now we come to the question of reserves. What reliable supplemental force have we in the event of war? An examination of the facts will show that it falls far short of what should be ensured in that event. In view of any probable combination against us, we should necessarily commission all our efficient ships, and fill up with men those short of complement. To do this we should have to empty the home ships, and from the "Excellent" and "Cambridge" could be obtained 1,500 men. But this would not be sufficient, and we should have to fall back on the Coast Guard. Of these there are about 4,000, constituting the only efficient reserve we possess, and a large number of these must be put down as ineffectives. To meet the want of a sudden expansion, the Royal Naval Reserve was instituted, which consisted in obtaining a hold on merchant seamen, by offering a retaining fee of £6 per annum to join, on condition of undergoing a few days' drill every year, when they are placed on an equal footing with our regular sailors as regards pay and provisions. What is the result? We have sent all our sailors to sea, but must have a strong force at home to protect our coasts and man the reserve ships. The Royal Naval Reserve men are called out, and from those who are in England we obtain about 5,000 imperfectly trained and undisciplined men. But now, more than ever, we require men fairly well drilled and accustomed to the discipline of a man-of-war, and that cannot be obtained by requiring a number of merchant seamen to undergo a few days' drill every year; drill, too, that is intermittent or divided into short periods at different times. After all, we do not need a very great number, but our reserves should be thoroughly efficient, for there would be no time to take their training in hand after war had

commenced. I am of opinion that the Royal Naval Reserve is too costly, and could not be relied on except for home defence; but that our reserve should be taken from the Navy itself by some system similar to this. At the present moment, when a man's ten years is up, we offer him an inducement of two pence a day additional pay if he will remain and re-engage. Of course some do, but not the majority, as should be the case, because this only represents £3 more per annum. But I have stated it to be my opinion that, by offering sixpence to men worth keeping, we should immensely improve our crews, and not require to enter so many boys to keep up the number. Some people say, however, the more we pass in and out of the service the better, as we could always obtain them on an emergency by offering a bounty. That seems to me a fallacy, and I would suggest a plan by which in time we could have a really efficient reserve. Instead of inviting merchant seamen who are totally unacquainted with the duties of a man-of-war, allow men who will not re-engage after their first ten years to enter a reserve force, with pay or pension, whichever you like to call it, of fourpence a day, and for which they shall simply have to undergo a requalifying course once a year, with the liability of being called out in war time. They would be free, then, to enter the merchant service, and so gradually tend to bring the two services into closer union; or they would pursue some other calling in their native place, which would not interfere with their periodical drill. Whilst undergoing this they should receive the same pay and allowances as the Royal Naval Reserve do now. So the cost would be the same, but we should have an entirely different class,—men brought up in the Navy, who would have no difficulty in keeping up a good knowledge of the drills they had already learnt. These might be called the First Reserve, and after a total of twenty years' service, be eligible for Coast Guard and other appointments, reserved for pensioners. From these men could be formed a special Torpedo Defence Corps, to perform the work now assumed by the Engineers—that of protecting our coasts and harbours by submarine mines. A certain number from each station could be sent to the Torpedo School-ship for special instruction, and then be attached to the Coast Guard. During the summer they would practise the fitting up and laying down of mines, and in the winter be receiving instruction. To carry out such a project properly, we should, of course, need Officers attached, who could be obtained from the Active or Retired Lists. At the head should be an Officer specially selected, and we have at present two or three well-qualified, and who could thoroughly organize such a scheme as I have roughly sketched. It may be asked, Why not leave the matter of coast defence in the hands of the Royal Engineers? but be it remembered that their ordinary functions are in quite a different sphere, and we could not spare a sufficient number from the Army to assume these duties entirely and everywhere. It seems to me that this is a work especially belonging to the Navy, and that we have in the Naval Artillery Volunteers a body of men well adapted to assist in such an undertaking. I do not mean to say that they could be entrusted entirely with torpedo defence, because the majority have other callings,



and can only give a portion of their time to these extraneous duties. But amongst them are many retired naval Officers and others accustomed to the sea, who could qualify in this new branch. However much the spirit is to be admired which has led to the formation of the Naval Artillery Volunteers, they will not, I am sure, assume for themselves anything beyond a purely defensive sphere. In the hour of need they would be a valuable acquisition, but a volunteer force cannot take the place of an efficient reserve, from which to recruit and expand our regular force in time of war. In conjunction with the Royal Naval Reserve they could be relied on to form a fairly powerful defence against invasion, and to render ourselves secure against that, should be the primary consideration in dealing with the subject of a Naval Volunteer force. The possession of such, if properly organized and in sufficient numbers, would also enable us to despatch a large force abroad, and free the regular Navy for offensive operations, which has ever been its special function.

Want of men seems to be our chief weakness. Ships we have and could buy, but the crews to man them efficiently would not be forthcoming. In France we see the plan pursued of an intimate connection between the Merchant and Imperial Navy, by which nearly every man in the merchant service passes four or five years in the Navy, and afterwards can be recalled in case of war. I believe about 7,000 men pass annually into the Navy, are retained for the period mentioned, and are carefully drilled and instructed. Thus, at all times, France is enabled to obtain a great number of men who have actually served on board a man-of-war, should she need any sudden expansion of her naval force. Of course such a system is not unalloyed with evil, for under it you lose the men just when they are becoming efficient and well-trained, while the weapons of to-day require a greater degree of intelligence and experience than heretofore. I am inclined to think, therefore, that the ten years entry is the best, if we could only have a reliable reserve when any strain is brought upon our naval resources.

There is one point which deserves to be remarked, and that is the great number of men on board an English man-of-war who cannot be utilised in the event of heavy casualties at the guns. We are literally inundated with cooks, stewards, and servants, who are only available as carriers, and that under a rigid surveillance. Especially is this noticeable in the Mediterranean, where Maltese form a considerable proportion of our crews. There seems to me no reason why nearly everybody on board should not be instructed in the use of weapons, especially the stokers and mechanics. In the French Navy we find this carried out, so that the fighting strength of one of their ships is, humanly speaking, numerically superior to one of ours of equal size. I am not of those who advocate the abolition of the Marines, but rather would desire to see their numbers increased, especially on board ship. The plan adopted some time ago of utilising them as officers' servants appears to me worthy of extension, but they should be in addition, and not deducted from the strength of the detachment. If bands could be obtained from the same source, it would

be a great improvement on the present system, by which we obtain wretched musicians, and men useless for fighting purposes.

In leaving this portion of the subject, I will briefly recapitulate what appears to me to be required for a Supplemental Naval Force.

That we should have a First and Second Reserve.

The First Reserve to consist of Coast Guard men, and men who, having served ten years in the Navy, are given fourpence a day on condition of their undergoing certain drills during the year, with the liability of being called out in war time.

The Second Reserve to consist of the Royal Naval Reserve and Royal Naval Artillery Volunteers.

The former to man extra ships and fill up vacancies, the latter to be employed in coast defence. That a special Torpedo Defence Corps be established, consisting of sailors who have served their time at sea, and Officers who have retired from the Navy, or have had some connection with the sea.

That a reserve of Officers be obtained by giving certain appointments to the Retired List, to include the Coast Guard Service.

That the force of marines be increased.

#### *Colonial and Home Defence.*

The necessities of Colonial and Home defence would appear to assimilate in their conditions, and yet some difference exists which leads me to treat them separately.

Now, as far as our Colonies are concerned, it cannot be doubted that we must be satisfied with such dispositions as will enable them, at any rate, to exhibit some power of defence, independent of any assistance the mother country may afford. Not that I infer they should be left to their own resources, but simply to imply that upon every colony which claims self-government devolves the duty of providing some measure of self-preservation. We must always bear in mind that any nation engaged in war against England could find an extended sphere for offensive operations in our Colonies and distant possessions. Against these, and the destruction of our commerce, foreign writers have always declared would be the direction in which the power of their country would be applied in such an event. Though England has never carried on a defensive warfare in so far as the Navy is concerned, but always exhibited a vigorous offensive movement as the best defence, yet in the contingency of an enemy's force eluding our vigilance and appearing off any of our possessions, there should exist some defensive organization to offer a successful resistance.

I am afraid that few of our Colonies possess this, and also that we were somewhat hasty in withdrawing our troops till such had been assured.

Six years ago I was stationed in the Pacific, and was much struck with the isolated and unprotected state of our possessions in that quarter. British Columbia and Vancouver's Island would be practically helpless, for at that time (and I think it is unchanged), there was not a single fortification or gun mounted, and no armed force, except

a few volunteers. In 1870, British Columbia was incorporated with the Dominion of Canada. Since then, instead of thoroughly organizing a system of defence, they have done nothing but squabble about a railroad which Canada pledged herself to build across in ten years, but now finds it necessary to abandon. At present there is practically no communication, except through the United States, and under such circumstances, Colonial defence assumes a great importance, for unable to alter facts, we must endeavour to provide something out of the materials at hand. A country like Canada has great resources in this respect. An extended sea frontier and vast fisheries gives her a sea-faring population numerically large. Here is the foundation of a splendid Naval Militia. Give them training, and you have a reliable force in time of need. But before dealing with this part of the subject, it is necessary to determine—1st. What points are to be strengthened; 2nd. In what manner they shall be defended.

Now it seem to me certain that in view of the gigantic dimensions of our foreign possessions we must be satisfied with a limited number of well-defended points, rather than attempt an all-round defence. These places have been settled by general acknowledgment, but little effort has been made to carry into effect any substantial measure of defence. As regards the manner in which such points should be defended, I will assume that the chief danger to be feared is from the sea, and experience teaches us that stationary fortresses have not a value corresponding to their cost, but of all such defences those formed of earth have the greatest advantages when exposed to a heavy fire from large guns. Earthworks, then, may form part of our system of defence, but they should only exist at special points, and be supplemented by vessels and torpedoes. For the defence of Colonial harbours we require vessels carrying the heaviest guns, and protected by armour-plating of average thickness; and I think the nearer they approach to floating fortresses, as distinct from the ordinary type of ship, so much the more efficient they will be in the special purpose for which they are to be employed. Attached to these vessels should be a certain number of gunboats, carrying one heavy gun, with sufficient beam to give a steady platform without aiming at great speed, a quality not essential to harbour defence. Furthermore, torpedoes must be largely made use of, and they will be found most efficient for closing entrances and channels. To supply the men to work these various weapons I would suggest that our principal Colonies have a small standing navy, just sufficient to keep the ships in order and for training, and that a reserve be formed similar to our own Naval Reserve, which shall be in detachments of men undergoing a certain period of drill on board the floating batteries and tenders. There should also be a vessel for torpedo work with its permanent staff, who would instruct and practise laying down mines, selecting those men who showed greatest aptitude to form a special corps. Steps should be taken in the formation of a land force that would co-operate by constructing earthworks, and have an organization complete for immediate mobilization if the landing of an armed force at any point should be threatened. It is certain, however, that little can be done without



material assistance from this country in some shape; and we could well afford a certain sum annually for such an object, in addition to turning over to our Colonies guns and ships that we no longer require.

I would also here point out the necessity of having a dock capable of taking in a large ironclad on every station. We continually feel this want at the present time, how much more should we in the time of war.

What applies to Colonial defence applies also in a great measure to Home defence. There is, however, one thing to be observed, and it is that with a navy powerful enough to blockade an enemy's ports, so as to prevent him issuing forth to make a descent upon your own coasts, you have already an almost perfect defence. But as under certain circumstances this might be impossible, it is necessary that some organization should exist for Home defence alone, which would enable the bulk of our regular force to carry out offensive operations in any part of the world. This duty I would apportion to the reserve, which should be called out on the first declaration of war. Fairly efficient ship's companies could be formed out of the present Naval Reserve, with petty officers from the Coast Guard, and officers from that source or the Retired List.

The most useful manner in which they could be employed would take the form of a flotilla of gunboats, each carrying a heavy gun, and I think it would be an excellent plan if a certain number of these vessels were attached to each reserve ship, and a portion of the drill period now carried out in the large vessel allotted to the gunboats. No better training could be found than getting under weigh, and going out of harbour for the day, in order that they might have practical experience of firing at sea, and derive a general knowledge of other matters connected therewith. In addition to these vessels, each reserve depôt should have attached to it a special torpedo-boat, thus forming a complete unit of defence, composed of an ironclad, gunboats, and torpedo-boat.

As regards what type of vessel is best adapted for the latter, and what peculiar torpedo they should be armed with, I am of an opinion that for the coast of England certain qualifications are imperative, and without under-estimating the value of a high rate of speed, I cannot recognise the usefulness of any type which does not possess a fair amount of seaworthiness.

This hardly seems to have been sufficiently considered in the swift boats that Mr. Thorneycroft has lately been building, one of which was ordered for the Navy, and is now undergoing trial. The "Lightning"—for such is her name—is 84 feet 6 inches long, with a beam of 10 feet 10 inches, and having a speed of 18 knots. This great speed is obtained in a variety of ways, but chiefly in engine power, for she has, I believe, the greatest amount of engine power to displacement of any boat yet built, being about 10 horse-power to 1 ton displacement. What this represents may be better understood by comparison, for, taking recent ships into consideration, the "Boadicea" has about  $5\frac{1}{2}$  horse-power to 4 tons displacement, and the "Temeraire"

about  $8\frac{1}{2}$  horse-power to 11 tons displacement. I cannot, however, consider the "Lightning" sufficiently seaworthy and handy for our purposes, whereas, by an increase of beam and decrease of length, though it would entail a loss of speed, she would be made more generally useful and reliable. It may be argued that such a boat would never be required to go outside a harbour, but we must remember that the effective range of any torpedo is limited to 600 yards, and therefore an enemy must be approached within that distance. Moderately rough weather would, I believe, prevent such a boat taking advantage of an otherwise favourable opportunity, if not be absolutely unsafe. It has been proposed that fleets should be protected by such vessels—for they can hardly be called boats—against counter-torpedo attacks; but for this service they would seem disqualified, by reason of their size. They are too big to be stowed like an ordinary launch, and quite unable to accompany a fleet independently. An improved steam launch would be more serviceable. At present they are 40 feet long, but by giving an increase of length they may be made qualified to use any torpedo, attain a speed of 14 knots, possess good seaworthy qualities, and yet be stowed on board with perfect ease.

Lastly, we must look upon Submarine defence as a necessity for the protection of our harbours and mouths of rivers. I have stated in a previous part of this essay my opinion that such a duty is peculiarly the province of the Navy, and sketched a plan for forming a Torpedo and Defence Corps. I am aware that the Royal Engineers have, for some time past, been engaged upon this work, both at home and abroad, and their experimental practice is very useful. But I doubt whether their four companies, which now comprise the whole torpedo staff, would be nearly sufficient, and feel certain they would have to be supplemented, not merely in manual labour, but also in men having knowledge of this special work.

I have not here considered it necessary to propose any novel type of ship for purely defensive purposes, such as the circular ironclad favoured by Russia, about which we heard so much before the war, but so little since, for I do not consider them adapted for the coast of England, whatever valuable qualities they may exhibit in the Black Sea. Russia must now regret that so little attention was paid towards constructing an ironclad fleet, for she cannot but feel humiliated in seeing the part her Navy has played in this war. Had she but followed the example of Germany, Austria, Italy, and Turkey, affairs in the East might ere now have assumed a different phase.

I have no more to add on this last point of the essay. My object has been to combine efficiency with economy, and, therefore, no special type is proposed, but simply to utilise the materials we have to the best advantage. I am convinced that a combination of the several points here laid down would render the country secure against attack, and assure the object of coast defence.

#### *Conclusion.*

I shall conclude with a few general remarks upon certain matters

that appear to me worthy of consideration in the organization required to secure a powerful and economic Imperial Naval Force. I do not intend, however, to propose any change that will involve a large outlay, for with but a slight increase of the present estimates we ought to obtain a Navy that shall be above suspicion. I shall only, therefore, offer some suggestions appertaining to officers, men, and ships, which I think, if carried out, would tend to increase the efficiency of the service. There are few matters connected with the Navy about which opinion is so much divided as that of the entry and early training of naval Officers. Aristotle has said that, "All who have meditated on the art of governing mankind have been convinced that the fate of empires depends on the education of youth." With equal truth may it be said that on the early training of Officers depends much of the general efficiency of the Navy.

For such an exceptional career it can hardly begin too soon, and yet experienced men have asserted their opinion that Officers should not go to sea till the age of 18 or 19. Simultaneously has arisen a predilection for a college education, and a tendency to unduly exalt theoretical knowledge over practical experience. A decision has been arrived at to replace the "Britannia" by a college on shore, whereas my own opinion is that the former fulfils in an admirable manner the purposes for which she was originated. Here the youthful mind receives its first impressions of the after career, instinctively becomes imbued with the spirit of discipline, and indirectly acquainted with professional attributes. At the same time there is no reason why the internal arrangement of such a ship should interfere with any course of study that may be deemed essential, and if the expense of this establishment be mooted, we must also remember that it forms an item in our maritime strength.

If, however, it is settled beyond recall to have a college, but not the site, I would strongly urge the vicinity of Portsmouth, which is our chief naval port, and where opportunity would be afforded of observing all the important matters connected with the fitting out of ships, their armament and machinery, thus enlisting all the sympathies of the boys in that profession which they have entered. I have a vivid recollection of the delight which a visit to the dockyard always afforded me as a cadet, only equalled by an excursion on board a *bonâ fide* man of war.

As regards the education when on board a sea-going ship I think it would be advisable not to appoint midshipmen to ships that have no Naval Instructor, for many of the failures to pass examinations can be traced to that source; but that all Sub-lieutenants should spend a portion of their time at least in a small ship, and so gain practical experience and a good knowledge of seamanship.

A great evil at present is the time young Lieutenants spend on half-pay when first promoted. All should at once be sent to the gunnery ships for a course of gunnery and torpedo instruction, and then appointed to sea-going ships, the first selections being made by order of merit. It seems to me that it would be far better to have an additional Lieutenant in every sea-going ship, for whom instructiona-



and other duties could be found, rather than put them in harbour ships, where they can gain little professional knowledge.

As regards the employment of Commanders after promotion, I do not think it can tend to efficiency that Officers on the Active List should hold Coast Guard appointments; especially now, when naval matters are daily becoming more complicated, and scientific advance renders a close and continued attention an imperative necessity. Such a period as must elapse before appointment to a sea-going ship would be more advantageously applied in a study of the higher branches of nautical subjects. That many do so now, shows commendable zeal, but a good deal hinges on the question of half-pay, and I hope the day is not far distant when some modification of the present system may be deemed feasible.

Of an equal importance with all that concerns the efficiency of Officers, is a similar care for the training of our men. Complaints are now being freely raised as to the scarcity of petty officers and mechanics, as well as to the rawness of our crews. I have before attributed much of the latter to the loss of most of our best men after their first ten years has expired, for want of a sufficient inducement to remain. The scarcity of mechanics and artificers is owing probably to the advance of all wages on shore, so that in the Navy we cannot obtain good workmen. The hope and knowledge of a future pension does not counterbalance the prospect of a larger sum at once. Under such circumstances, there is no choice but to increase the pay, and obtain good men at a greater cost.

There is no difficulty, however, in obtaining sailors. We take them as boys, train, and then let them go. More than sufficient come into the Navy, and if, as many assert, they are an expensive article, all the more reason for retaining them when beginning to repay some of the time and money expended on their training. It is said that every boy we train for the Navy costs the country at least £300 before we make him an able seaman. I myself am so convinced of the importance of naval discipline and training from earliest youth, that I do not think any other system advisable, and the extra expense is well redeemed. I think, however, that the want of able seamen and petty officers, now so much felt, might be prevented in a measure by a more extensive sea-training for ordinary seamen in special ships, whereas men are now pushed on to fill vacancies in higher ratings without ability or experience. For such reasons do we see occurring occasionally those mild outbreaks on board ships against discipline, which result almost entirely from want of authority and influence on the part of the older hands.

In these days of costly and complicated weapons, more than ever is it necessary that all training should be thorough. Among other great improvements of late years, none has effected such great benefit to the service as the School of Gunnery at Portsmouth. The time has, however, arrived when the want of the service in this respect has outgrown the establishment. The increase in the number of men, and the course they undergo, would seem to urge some change in existing arrangements, and I would recommend a building on shore, with a

sea-going gunnery-ship attached. The "Excellent" obviously does not fulfil all the conditions now necessary to give the training required, and the way men fall short when actually firing at sea is lamentably observable. This simply results from want of practice in engaging a movable object, for most of the firing takes place from an immovable platform or deck, at a stationary target. When under weigh, and proceeding at a certain speed, a very different result follows, and considerable practice is required to make even fair shooting; so there has been a tendency to reduce the speed, and attention has been called to the Admiralty order that target practice should take place at a rate of eight knots.

For this and other reasons I advocate a gunnery establishment on shore, with tender attached, and drill-sheds for carrying on other drills in all weathers. At present half the time is spent in pulling backwards and forwards, while for wet weather little or no provision is made. Such an establishment might include gunnery and torpedo, for the latter is now assuming an equal importance, and certainly, for a country like England there is room for improvement in this respect.

But a few words as regards ships. They are rapidly losing their old individuality and assuming a new. That this should happen was patent to all when the struggle began between ordnance and armour. Under the influence of old associations and ideas we still strive to retain some of those attributes for which our ships have been distinguished, but in most cases success has not attended our efforts. We cannot yet come to the conclusion that for a fighting ship masts are no longer necessary, but they also reduce the offensive capacity of a ship. What the "Inflexible" may be in the future, rests probably on the decision of a few experts; but I doubt that, under any circumstances, her sail power could save her from disaster or conduce to economy.

I have in this essay jotted down some of the impressions my mind has retained from time to time when on active service. Many of the ideas here expressed no doubt are crude, but if a few only should lead other people to think upon the same matters, the labour will not have been thrown away.

# GREAT BRITAIN'S MARITIME POWER, HOW BEST DEVELOPED, &c.

By Commander GERARD H. U. NOEL, R.N.

(Gold Medallist, 1876.)

“Arma pacis fulcra.”

## *Introduction.*

THE difficulties to be contended with in writing an essay of this description are numerous, and even the most able and politic writers can scarcely avoid the appearance of being didactic and presumptuous; indeed, it almost seems a part of the writer's duty—in order to explain his views to the full advantage—that he should observe his subject from points infinitely higher than his natural position. Our subject on this occasion is so comprehensive that the difficulties are more than ever multiplied, and in grappling with them we must endeavour to view the aspect of affairs, not only from the stand-point of authorities on all branches of the naval service, but also as a “great national question.”

We might envy the prize essayist of last year, and others whose papers were honourably mentioned, and published in the Journal of the Institution, not only on account of the ability and profound historical knowledge displayed, but also for the fact of their subject being one which (while leading to equal honours) was not calculated to draw from the writers opinions and views opposed to those held by people in authority, nor likely to evoke sharp criticism and severe handling at meetings for discussion.

However, we must endeavour to master the difficulties, and trust for the indulgence of those to whom a too decided expression of our views may appear presumptuous.

## PART I.—*On Naval Policy and Administration.*

(This part is omitted, it having been judged by the referees as containing observations that did not come within the limits assigned to the essay.)

## PART II.—*On Fighting Ships.*

The fighting ships of the Royal Navy we will divide into four series.

The first series will include all sea-going vessels over 5,000 tons; these will compose the ironclad fleet.

The second series will include all vessels between 2,000 and 5,000 tons; these will be the “fast ocean cruizers,” some slightly protected with armour, and all being rams.

The third series will include all the smaller sea-going vessels.

The fourth series will include the coast defence ironclads, gunboats, and torpedo vessels.

In treating this portion of the essay, it will be convenient to refer to the last prize essay on naval subjects, which includes all the different types of vessels necessary to fight our battles on the ocean and near our shores, and will therefore form a basis to work on, and be a guide for our arguments. Since 1875 there have been several small



items of naval warfare afforded us, and besides this, various inventions and improvements in material, which are likely to influence the manœuvring of fleets and the construction of war vessels.

*The First Series: Ironclads.*—To begin with our principal fighting ship, our ship of the line, our champion in all parts of the world, the embodiment and upholder of our power, what is she to be?

She must be a swift and powerful ram, she must carry guns and torpedoes, and she must be armoured to an extent compatible with absolute safety as a sea-going vessel in peace time, with the most perfect protection attainable of her vital parts in action; and she must be constructed with so large a reserve of floating power, that she may sustain considerable damage below the water-line without fear of sinking.

Let us now glance at the services a vessel of this description may be engaged upon. *First*, she may be opposed to her counterpart in single combat: here the result would principally depend on the skill shown in managing the ship and the proficiency in gunnery practice, the guns necessarily having a large arc of training. *Secondly*, she may take a post in the line of battle, where her ram-bow will be her chief weapon, and she will bring her guns and torpedoes into action, as opportunities occur. *Third*, she may be opposed single-handed to a squadron of gunboats, each carrying one heavy gun. This will necessitate her carrying a fair number of guns of limited size, and making good use of them. *Fourth*, she may be opposed to forts, in which case her ram and torpedoes will be useless, and her guns of paramount importance. *Fifth*, she may be opposed to two or more unarmoured vessels, in which case her battery of moderate sized guns would be invaluable, torpedoes and ram-bow being used when practicable.

We, therefore, come to the following conclusions on the question of armament for sea-going ironclads: a ram-bow of necessity; a fair number of moderately heavy guns (*i.e.*, twelve to twenty tons in weight), having a large amount of training (possibly 90°), and torpedoes to any *safe* extent that may be thought desirable.

Going further into particulars, first with respect to the shape of the ram-bow, opposing Mr. Scott Russell's theory in favour of the "*chisel*" versus the "*punch*," let us join with those Naval Officers who advocate the "*Hercules*" stem as a pattern, and prefer it to the sharper snouts of the "*Devastation*" and "*Bellerophon*," or the new types exemplified in the bows of the "*Inflexible*" and the "*Nelson*." As regards the strength of the ram, it appears only wise that a part of the ship of such eminent importance as the stem should be equal to encountering any possible strain without damage: and here we may learn a lesson from the above distinguished authority, who says as follows:—"For this purpose the stem must be formed by gradually growing out of the ship's bows in plates overlapping thicker and thicker until they become a thick, smooth, inflexible stem."<sup>1</sup>

Next, as to the question of guns.

In support of the argument in favour of a large number of moderate sized guns, the following Tables I, II, and III, have been drawn up, which may be useful in calculating the value of the different systems of armament.

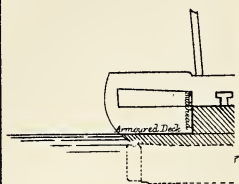
See "Journal of the Royal United Service Institution," Vol. xxi, No. 91, p. 714.

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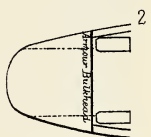
LATE 2.

SEA GOING IN 8,000 TONS DISPLACEMENT.

Length 2



Horizontal Sec  
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cale

COAST DEFENCE T 8 12 16 20 Feet

L

LATE 3.

COAST DEFENCE IRONCLAD OF 10,000 TONS.

Section through A.B. (See below)

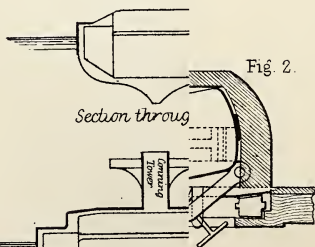
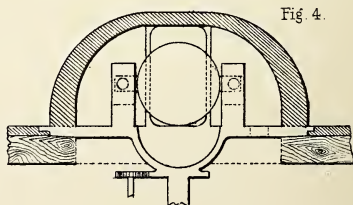
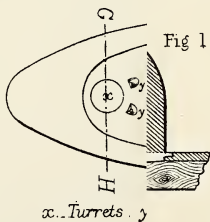


Fig 2.

Section through

Scale.

Section through

8 12 16 Feet

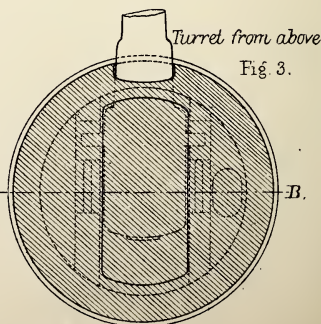




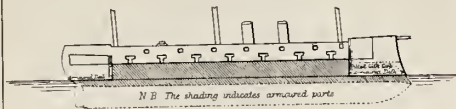
TABLE I.—Comparative Power and Weight of Guns.

Nature of gun.	Weight of		Elevation required for range of 4,000 yards.	Velocity in feet per second.		Energy in foot tons.		Piercing powder. Thickness of iron armour in inches, pierced at 100 yards.	Total weight of gun complete with ammunition and stores.	No. of guns composing 1,000 tons of armament.
	Battering charge, pebble powder.	Projectile.		At muzzle.	At range of 4,000 yards.	At muzzle.	At range of 4,000 yards.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	Lbs.	Lbs.	° /					Inches.	Tons.	
2 16-inch 80-ton..	370	1,700	..	1,520	1,179	27,213	16,389	26·4	About 250	4
12 5-inch 38 "	130	800	7 10	1,451	1,052	11,676	6,137	17·7	" 100	10
12 " 35 "	110	700	7 17	1,300	987	8,200	4,728	14·6	" 85	12
12 " 25 "	85	600	8 9	1,300	968	7,030	3,900	13·1	" 67	15
10 " 18 "	70	400	7 56	1,364	982	5,160	2,675	12·0	49½	20
9 " 12 "	50	250	8 17	1,420	945	3,496	1,548	9·6	33	30
8 " 9 "	35	180	8 34	1,413	920	2,492	1,056	9·5	26	39
7 " 6½ "	30	115	7 30	1,525	916	1,855	669	7·1	18½	55
64-dr. 64-cwt. ..	8 R.L.G.	64	..	..	..	..	..	0	7½	136

PLATE 1

SEA GOING IRONCLAD 16 GUNS, 8,000 TONS DISPLACEMENT  
Length 280 feet. Beam 62 feet. Draught aft. 25 feet

BROADSIDE VIEW



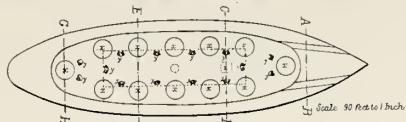
Horizontal Section, through main deck showing position of Gun platform.  
The foremost and after Guns pointing towards Bow and Stern



Scale 90 ft to 1 inch

PLATE 4

COAST DEFENCE TURRET IRONCLAD, 12 GUNS, 10,000 TONS DISPLACEMENT  
Length 300 feet. Beam 78 feet. Draught 21 feet  
DECK VIEW SHOWING POSITION OF TURRETS



x...Turrets. y Loading scuttles or ports (one to each Gun) z...Conning Tower

SECTIONS OF THE ABOVE SHIP  
Scale, 60 ft. to 1 inch

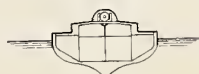
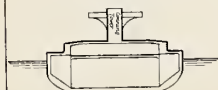
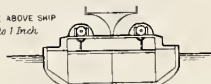
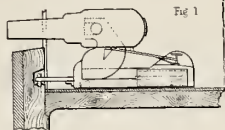


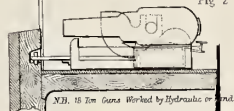
PLATE 2

SEA GOING IRONCLAD 8,000 TONS DISPLACEMENT

Section through gun port  
Gun in firing position



Gun in loading position



N.B. 15 Ton Guns Worked by Hydraulic or Hand

Scale  
Feet 0 3 6 9 12 15 18 21 24 27 30

Section through ship side  
between main deck gun-ports

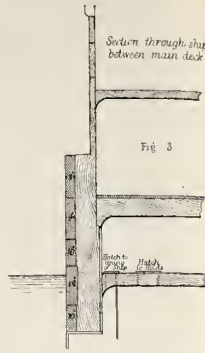
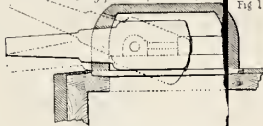


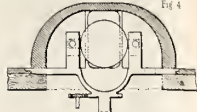
PLATE 3.

THIRTY EIGHT TON GUN TURRET FOR COAST DEFENCE IRONCLAD OF 10,000 TONS.

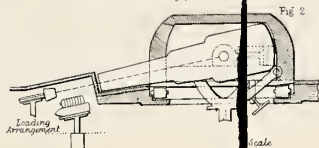
Section through turret, gun in firing position (recoil 3 feet)



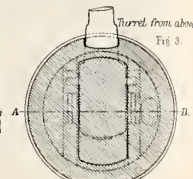
Section through A.B (See below)



Section through turret  
Gun in loading position



Turret from above



Scale  
Feet 0 3 6 9 12 15 18 21 24 27 30

TABLE I.—*Comparative Power and Weight of Guns.*

Nature of gun.	Weight of		Elevation required for range of 4,000 yards.	Velocity in feet per second.		Energy in foot tons.		Piercing powder. Thickness of iron armour in inches, pierced at 100 yards.	Total weight of gun complete with ammunition and stores.	No. of guns composing 1,000 tons of armament.
	Battering charge, pebble powder.	Projectile.		At muzzle.	At range of 4,000 yards.	At muzzle.	At range of 4,000 yards.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	Lbs.	Lbs.	° ' "					Inches.	Tons.	
16-inch 80-ton..	370	1,700	..	1,520	1,179	27,213	16,389	26·4	About 250	4
12·5-inch 38 "	130	800	7 10	1,451	1,052	11,676	6,137	17·7	"	10
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12 " 25 "	85	600	8 9	1,300	968	7,030	3,900	13·1	"	15
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9 " 12 "	50	250	8 17	1,420	945	3,496	1,548	9·6	33	30
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64-rdr. 64-cwt. ..	8 R.L.G.	64	..	..	..	..	..	0	7½	136



The first nine columns of this table are taken from the "Treatise on the Construction of Ordnance, 1877," and may therefore be fully relied upon; of these Columns 3 and 4 show us that the range and velocity of all heavy guns are so nearly the same, that in our calculations of the power of guns we may fairly estimate them as equal. Columns 7, 8, and 9 are interesting in showing the work that can be done by the heavier ordnance; this has already been increased by the enlarging of the powder chambers of the 80-ton and 38-ton guns, an important discovery which will no doubt be extended to all heavy guns. Column 10 is partly taken from the "Record of Naval Ordnance," the weights of the three first guns, with their ammunition and gear complete, being an approximate estimate. Column 11 is a calculation of the number of guns of different calibres, as they might be carried on board ship, the total weight of armament in each case being 1,000 tons.

TABLE II.—*Comparative Rapidity of Fire, obtained from Official Reports of Prize Firing in 1875.*

Nature of guns.	Names of ships and number of guns of which average was taken.	Average (actual) time of firing 8 rounds.	Average time of firing 1 round.	Average number of rounds that can be fired in 10 minutes from 1 gun.
1.	2.	3.	4.	5.
16-inch 80-ton..	No trial, but roughly estimated at	" "	3 20	3
12 5-inch 38-ton	" " " "	" "	2 30	4
12 " 35 "	"Devastation," average of 4 " guns.	16 5	2 1	5
12 " 25 "	"Monarch," " 4 " "	16 22	2 3	5
10 " 18 "	"Sultan," " 8 " "	9 30	1 11½	8½
9 " 12 " {	"Triumph," " 20 " "	5 15	0 39½	15
	"Iron Duke," " " "			
8 " 9 " {	"Northumberland," " 24 " "	6 50	0 51½	11¾
	" " " "			
7 " 6½ "	"Agincourt," " 22 " "	6 43	0 50½	12
	"Triumph," " " "			
64-pdr. 64-cwt. {	"Iron Duke," " 4 " "	4 34	0 34½	17½
	" " " "			

In this table we have official record of the rapidity of firing the guns of 35 tons and under, and in all these cases the firing was judged to be good, or the ships would not have stood so high in the lists as they do. The "Iron Duke" and "Triumph," with their 9-inch 12-ton guns, made the best gunnery practice; the "Northumberland" and "Agincourt," with smaller guns, falling short of them in time, the latter principally owing to the difficulty of laying the guns accurately and quickly with tackles instead of winches for training.

Column 5 gives the number of rounds that can be fired by one gun in ten minutes deduced from the trials previously recorded in columns 2 and 3, in all the cases except the first two, which guns have not yet undergone the test. In order to make this table more complete, we have estimated three rounds in ten minutes for the 80-ton, and four rounds in ten minutes for the 38-ton gun, as being, if anything, an exaggerated representation of the rapidity of their fire.

TABLE III.—*Comparative Value of Systems of Armament, the Battery in each case being of equal weight, viz., about 1,000 tons.*

No. of systems.	Nature of guns.	No. of guns in each system.	Total No. of rounds that can be fired by <i>all</i> guns in 10 minutes.	Total weight thrown by <i>all</i> guns in 10 minutes (in tons).	Total energy displayed at 4,000 yards by <i>all</i> guns in 10 minutes (in foot tons).
1.	2.	3.	4.	5.	6.
1	16-inch 80-ton	4	12	9.1 tons.	196,668
2	12.5-inch 38-ton	10	40	14.3 "	245,480
3	12 " 35 "	12	60	18.7 "	283,680
4	12 " 25 "	15	75	20.1 "	292,500
5	10 " 18 "	20	170	30 "	454,750
6	9 " 12 "	30	450	50 "	696,600
7	8 " 9 "	39	458	36.8 "	483,648
8	7 " 6½ "	55	660	33.9 "	441,540
9	64-pdr. 64-cwt.	136	2,380	68 "	

In this table we have arranged, in order, nine systems of armament, the battery complete with ammunition and stores in each case weighing about 1,000 tons. Column 3 is the same as Column 11, in Table I; Column 4 is obtained by multiplying the preceding column into Column 5, Table II; Column 5 (of Table III) is obtained by multiplying the preceding column into Column 3, Table I, and reducing the result to tons; and Column 6 by multiplying Column 4 into Column 8, Table I.

Studying the results produced in this last table, we observe that System 6 (viz., thirty 9-inch 12-ton guns), can not only throw five times as much weight of metal as System 1 (80-ton guns), and 2½ times as much as System 3 (35-ton guns), in a given time, but also more than trebles the total remaining energy displayed in the same period by System 1, and doubles that displayed by System 3, even at so great a distance as 4,000 yards.

The much-despised 64-pounder battery (System 9) throws half as much again as the 9-inch battery (System 6) in weight of metal, but their power of penetrating armour is, of course, *nil*.

What must appear clear to everyone is, that moderately heavy guns can be carried in greater numbers, can be fired with greater rapidity, and are nearly equal in range and velocity to the heavier ordnance; and with these facts, if we look abroad at the armour-plating of nearly

all the ships we may have to oppose, we can safely decide that a 12-ton 9-inch gun is sufficient for nearly all purposes of ocean warfare, and that a 20-ton gun will probably be sufficient for any future emergencies; so that, if we can get batteries consisting of such ordnance, safely and steadily carried in wholesome, well-built ships, our object is gained, as far as gun-power is concerned.

The fact is, that the 9-inch is the gun most readily handled on board ship; it can be loaded and worked with more facility than any other, and a ship of 5,000 tons, especially built for the purpose, could be made to carry with ease a weight of 500 tons of these serviceable weapons.

Matters would be much improved if it were established that no ocean-going ironclad should carry a gun of more than 20 tons weight, this being the limit of size of the guns for our ships of the line. Special ships, for special purposes, might go to the extent of the present 38-ton guns, but that is the last limit of size that can be effectually handled at sea.

Larger ordnance can only be carried in such small numbers, that aim so uncertain as it must be from an ever-moving platform risks the object not being struck, when such an infinite value is concentrated in one discharge, that any failure is most serious, and before the gun can be ready again, the opportunity may be lost. Mr. Scott Russell, in his lecture on the "Development of our Modern War Fleet," speaks of breech-loading shell-guns being carried in large numbers, and these to be without training, able only to fire on either beam, with a few for firing ahead and astern. This arrangement did not meet with approval in the discussion, though a system of guns on permanent bearings would be as valuable as any other *in a general action, so long as the motive power of the vessel remained intact*; these are the only circumstances, however, under which training of guns would not add materially to chances of success.

The lecturer, on the above occasion, no doubt advocated this system on the principle of simplicity, and of avoiding complications, and this principle cannot be too strongly urged.

He says: "Though I am an engineer, though I believe in machinery, I advise you not to believe in clever tricks of mechanism, that I or anybody else teach you; and be sure of this, first, make your rudder and your steering-gear, and everything belonging to it, so that your crew can steer without engines or machinery; secondly, have your guns so arranged that they can be worked without a steam-engine being in good order, or the hydrant-press being in perfect condition, or without all the lines of the mechanism being mathematically true; take care that you can work, with your own crew, your own guns."<sup>1</sup>

What could be more straightforward and to the point than this warning, and what more in favour of moderate sized guns, that can be worked by hand, and are not dependent on steam or hydraulic machinery, which may be rendered unserviceable by the least bruise.

We will now say a few words on torpedoes, the last invented

<sup>1</sup> See "Journal" of the Institution, Vol. xxi, No. 91, p. 751.



weapons of destruction. What with Whitehead, Harvey, and boom torpedoes, a sea-going vessel ought to be able to do some damage to her opponents; but the uncertainty of their action limits their destructive power, and the danger of carrying and manipulating them considerably lessens the expediency of using these weapons in great numbers. It will, however, be necessary that all our vessels should be supplied with torpedoes as an auxiliary arm, and that ships proceeding to foreign stations should be also provided with sufficient stores to enable them to extemporize harbour defences and protect our colonial ports, in case of necessity, by laying down torpedoes.

So much for the offensive part of a man-of-war, which is of primary importance, for, as Commander Dawson, in the course of discussion, most truly says, "the purposes for which ships of war are built are to damage and destroy, by any means, hostile vessels and fortresses rather than themselves merely passively to keep out destructive projectiles."

Having decided on the general principles of our armament, let us proceed with a short description of the ship that is to carry it.

In the essay referred to at the beginning of this part, the writer is strongly in favour of making sea-worthiness, with a large reserve of floating power, the first of all considerations. In this, the whole Navy must agree with him.

Next, of constructing a ship in a manner that will admit of her carrying powerful engines and steering gear, both well sheltered from the dangers likely to be incurred in action. This, again, all will consider advisable. On coal-carrying power, nothing particular is said in this essay, but Mr. Scott Russell and others strongly advocate the coal-space being increased, so as to enable a ship to steam at least 5,000 miles. If you put aside  $\frac{1}{10}$ th, or at most  $\frac{1}{8}$ th, of displacement for weight of coal, it will be as much as we can afford, and then we must decide on giving our sea-going ships sail-power to assist them. We read, in the lecture on "Our Modern War Fleet," that power of carrying coals depends on the length of the ship. Surely this alone is a good reason for stinting the amount to be carried, for, though the lecturer declares that he is able to make any length of ship as handy and easy to turn as the most perfect of our present vessels, there is no doubt but that, on the same principle, he could make a shorter ship infinitely more handy than his ship of great length. So, as we *must* have handiness, we must limit our length, and this will limit our coal-carrying power. A man-of-war has not only to make long passages, but her engines must be heavier, in order to stand the undue strain which may happen in manœuvring or fighting, and, what is even more fatal to her power of steaming, her boilers must be low down and under protection, and, when so placed, can only with the greatest difficulty obtain the requisite draught.

Going on now to the question of carrying armour, which is the protection against artillery, in the last Naval Prize Essay, a belt, 10 feet wide, is recommended for all ships of the line, the thickness of the armour varying with the tonnage; and it is proposed that this belt be built up at the bow and stern, to protect the ship from raking

fire. But this plan has its drawbacks, and no doubt is subject to improvement. In the first place, looking at the midship section of a ship so plated, it becomes very apparent that you must either cover the deck, joining the upper parts of the belt with armour, to prevent a shot that passes close over the near-belt with a slight curve, knocking away the opposite side at the water-line, or doing great damage by taking the armour plates in reverse, or you must build your armour higher, if you do not wish to plate your decks. Next, the gun-carriages and pivot-bolts are wholly unprotected, and lastly, the armour forward and aft is heavier than it should be in a sea-going ship. Now, without departing from the main principles of the former essayist, namely, "of placing the heaviest armour over the vitals; of avoiding top weight, and of arranging the battery along the whole broadside," we will endeavour to work our plating into a more serviceable shape, and so afford a slight protection for our gun machinery, a reduction in the weight at the extremes, and in the danger of curved fire from abeam. It seems that this might be done by constructing a 6-foot belt of armour from the water-line downwards, all round the ship, and a belt, 12 feet high, above the water-line all round in the wake of the battery, such battery being three-fourths of the length of the ship, and then sealing in the part before and abaft it, by an armoured deck at the water-line, the forepart above this deck being filled with cork to a height of 8 feet; we should then have the armoured part of the vessel 12 feet out of water throughout three-fourths of her length; the armoured bulkhead forward (forming part of the battery belt) would be raised to an additional height of 8 feet, for protection against raking fire from ahead. See Plate I (Vol.-Plate XI).

The amount of armour must vary in proportion to the size of the ship, and taking this at .225 the whole weight, we could manage to plate a vessel of 8,000 tons on the above principle with 12 and 10-inch armour at the water-line, and 10 and 9-inch armour above this, as high as the gun-portsills. This system would be applicable to all ships intended as sea-going ironclads, whatever their size, no ships of the line being under 5,000 tons, the armour belts varying very little in width, but being thicker or thinner according to the size of the ship.

The position of the armour governs the position of the guns, which, in the system here represented, form a battery extending over nearly three-fourths of the length of the ship, and it could no doubt be easily arranged that both the guns' crews and the machinery of the battery should be kept almost entirely out of harm's way, by making the guns to recoil partly under shelter, and having the deck on which they work about 4 feet below the portsills, the guns when in, resting in a position half under cover of the protecting armour (see Plate II, Figs. 1 and 2), and the crew, by stooping down, would get the same shelter, always being placed on the side nearest the enemy. The bow-fire would be provided by two guns on the upper deck, which would work over the upper part of the fore bulkhead on each side, and, in the event of a chase, the two foremost main-deck guns could be trained ahead, and fired through ports, which on other occasions

would be kept closed ; the two after main-deck guns firing aft, when required, in the same manner, but being usually fought on the beam.

With regard to the construction of the remainder of the ship, let us suppose the part which is armoured, and all below it, to be complete as a floating and perfectly stable body, with plenty of freeboard ; upon this let the upper works be constructed, as light as it is possible to make them, compatible with power to resist the concussion of the guns. The size of the ports would be unlimited, the upper part being large enough to allow of a great range of sight, and the ship's side—composed of material that does not splinter—would be built up on the inner part of the armoured wall, so as to admit of its projecting about three feet, and thus affording protection to muzzles of the guns from a vessel sweeping past, in contact with the ship's side (see Plate II, Fig. 3) ; the deck above the battery would be slightly built and only strengthened in the positions of the bow-guns and conning-tower. On this spar-deck small guns would be worked, to point in every direction, and defend the ship against boat attacks.

For our principal protection against torpedoes, rams, and other sub-aqueous weapons, we must examine the plan of our holds ; here again we have the valuable advice of Mr. Scott Russell, 'who proposes a system of casemates, "and closed compartments entered only from "above." It is imperative for the safety of a ship-of-war, that she be divided into compartments, and we must put up with the inconvenience of difficulty in communications. Let all below the battery deck be carefully divided off, and if this can be more securely done by constructing the ship in different casemates, or tanks, and joining these tanks together in the build, by all means let this plan be adopted.

The lecturer on our modern war-fleet proposes to build his casemates up to the upper deck, enclosing one or two guns in each, and in some of our present ships, we have already half bulkheads, or traverses between the guns, with the idea of protecting the crews from splinters, and from the concussion of adjacent guns. It would be preferable if the battery were entirely clear, not a scrap of iron that is not absolutely necessary, or anything that would make splinters, showing above the line of the portsills ; but immediately below the gun-deck, the bulkheads should come up to the beams, enclosing spaces twenty feet long, and half the section of the ship in width and depth, with no communication between them lower than six feet above the water-line. The most difficult communications to arrange will be between the engine-room and stoke-hole, and those for the transport of coal. But in the first case this difficulty can be greatly lessened by the use of bulls-eyes in the bulkheads, and voice-tubes, and in the latter case by having present-use-bunkers, and carriage tunnels for replenishing them from other bunkers when required. Powder, shot, and shell would be hoisted directly into the battery, and provisions, stores, and water are the better placed for having compartments to themselves. Many of these tanks not actually required to be used in action might be made air-tight for the time, so that in the event of a hole being broken into them from outside, the full amount of air above such a



hole would be confined and prevent the water filling more than a certain portion of the wounded compartment. Ventilation will have to be carefully attended to, but that will naturally all come from above, air pumps being freely used. In all the compartments, except those of the engines and boilers, a deck would be constructed at about the water-line, having water-tight hatches leading to the holds below, and also to the lining of the ship. (See Plate II, Fig. 3.)

The explosion of an ordinary torpedo would at most damage or let water into two of these compartments, and the charge of a ram would have only the same effect, if it did not so completely sever one half from the other as to break the whole ship, or unless by skilful handling it managed to rip open a great part of one side, and so fill a large number of compartments, and cause the ship to capsize.

In completing our protections against torpedoes, we have one other method to consider, and that is, some system of obstruction calculated either to frustrate the attack of boats when at anchor, or creeping up a narrow channel, or the attack of the Whitehead and Harvey, when either in harbour, or at sea; harbour or passive obstructions are arranged without much difficulty, but how to ward off the Whitehead at sea is a more complicated question. However, this is now in the hands of an able Committee, and we may be sure, before we have these torpedoes fired at our ships, some protection will have been organized to render them powerless.

The controversy of torpedoes *versus* protection, is now resolving itself into one similar to that of guns *versus* armour, but to all appearances the result in *sea-fighting* will be reversed, in that the protection will gain the day, whereas in the other controversy the guns are decidedly victors.

To summarise the foregoing principles: our ship-of-the-line will be constructed as a ram carrying a battery of moderately heavy guns and armour-belts round the water-line and battery, but not protecting the upper part of the latter, except from raking fire. The total weights of the armour, the armament, and the coal to be carried, being respectively .225, .1, and .125, the weight of the ship or tonnage of displacement; that is, an 8,000-ton ironclad would have 1,800 tons of armour, 800 tons of armament, and 1,000 tons of coal; the remaining 4,400 tons being the weight of the hull, engines, and equipment; the guns will recoil partly under cover of the armour, all being made capable of firing on the beam, and with considerable training, four that can be fired right ahead, and two right astern when required. The upper works will be as light as possible, with a spar-deck to cover the battery, intended only for working ropes on and carrying light guns for service against boat attacks. The ship to be fully rigged, and of considerable sail power in addition to powerful engines and steering gear, both well under protection, admitting of a speed of at least fourteen knots under steam, and perfect handiness when manœuvring. Torpedo arrangements fitted as considered most convenient by the Torpedo School, and defences against hostile attacks made as complete as possible.

This we intend as the model of our Fleet, that Fleet which Sir

Spencer Robinson speaks of as so indispensable when he says, "Let that Fleet be the point to which you will gather up all your strength to fight that battle which will decide perhaps national existence."<sup>1</sup>

*The Second Series of Fighting Ships.*—We come next to the class of ships of which the "Shah" and "Amethyst" represent the extremes in size, and we are able to utilise these very two vessels, they having lately proved their powers and failings in an engagement with the "Huascar," a diminutive ironclad ram, carrying four 300-pounder guns in two turrets. The question naturally arises in speaking of this affair, "Would not both of our ships have been twice as formidable to the enemy if constructed with bows for ramming?" The answer would be "Certainly, and they should have sunk the 'Huascar' at the second, if not the first charge." Again it might be asked, "What would have been the result of the action if with able gunners the 'Huascar' had succeeded in repeatedly striking her opponents, and bursting 300 lb. shells at the water-line and elsewhere?" The answer would be, "In all probability our vessels would have been disabled, and at the mercy of the ram." As Admiral de Horsey admits, it was certainly fortunate for the "Shah," that she had opposed to her a ship carrying guns few in number and infamously worked, which, though of an obsolete nature, are still very destructive, when *skilfully* handled, and employed against unprotected ships. From this we may learn that it is advisable to afford some protection to the vital parts of our cruisers. Corvettes, and frigates of from 2,000 to 5,000 tons displacement, are required as the principal protection of our interests and commerce abroad; we should therefore be careful that they meet these requirements to the fullest possible extent. Such vessels should undoubtedly be rams, and would materially gain in power if protected over the vital parts by light armour to the weight of .06 of displacement; armament being provided to the weight of .08 of displacement, and carrying coal of .16 that weight; we have then .7 left for weight of hull, engines, and equipment.

Thus a 5,000-ton ship would be protected by 300 tons of armour (that is, a belt 8 feet wide, and 5 inches thick, covering two-thirds of her length at the water-line); she would carry 400 tons of armament, and 800 tons of coal, leaving 3,500 tons for weight of hull, &c.

In order to carry this small amount of armour it will be necessary to slightly increase the beam of the ship; but surely, judging from the extreme crankness of the "Gem" class, and indeed of all the long and narrow unarmoured vessels that have lately been constructed, this would be no great detriment, even if it reduced the speed under steam from 16 to 15 knots in the larger ships, and from 15 to 14 knots in the smaller ones. For it would materially increase their sail power, which is a great consideration, and would also benefit in their gun-platforms, for a crank ship, if listed in action through any cause, may have all her guns rendered almost, if not quite useless, all firing, except on the beam, being impracticable (on the principle of firing with your sights out of the perpendicular), and even beam fire being at a great disadvantage, if not altogether out of the question.

<sup>1</sup> See "Journal," Vol. xxi, No. 91, p. 738.

The armament of our ocean cruisers must necessarily be lighter than that of our ironclads, but the battery of the larger ones should consist of much the same guns as those of the "Shah," except that a frigate of her size, with greater beam, might carry 6½-ton 7-inch guns, instead of 4½-ton shell guns on her main deck. The armament of the "Amethyst" is formidable, but a vessel of her displacement should carry twenty 64-pounders, instead of fourteen.

Light armour has proved itself of more value than was expected, if it is true that the "Huascar," with only 5-inch plates, received so small an amount of damage, though hulled about 80 times with shell from two 12-ton armour-piercing guns, sixteen 4½-ton, and twenty-two 3-ton shell guns. This encourages us to persevere in our attempt to protect the vital parts of our cruisers, at the cost of having to sacrifice a small percentage of speed under steam. All classes of vessels of this nature should be fully rigged, every improvement in the way of material be instituted. That is, all standing rigging of steel or iron wire, and all spars, &c., while retaining the same relative strength, to be as light as possible, substituting steel for wood where practicable, the whole aim being to attain great efficiency of rig, combined with the least resistance to the wind, when steaming to windward.

Belonging to this series, a class of vessels represented by the "Iris" and "Carysford," built of steel, and for purposes of great despatch, all other considerations being subordinate to that of speed, will be found invaluable in time of war. But let such vessels be placed under the heading of "special cruisers" and not treated as ordinary ships for general service. These "special cruisers" would be built on the finest possible lines, of the lightest construction calculated to give them sufficient strength, having up and down bows, carrying no armour, and only a light armament, and should be provided with sail-power only as an auxiliary. Ships so constructed would have their weights divided as follows: armament, '03 of displacement; coal, '2 of displacement, and the remaining '77 for weight of hull, equipment, and engines. That is, a 2,000-ton ship would carry 60 tons of armament, 400 tons of coal, and her hull, &c., would weigh 1,540 tons.

This will complete the second series of fighting ships, all of which will be powerful vessels, fearing neither enemy nor storm, traversing the ocean and protecting all its highways, when England's trade is in danger. They must all carry torpedoes and must be similar to the ironclads in their internal construction, so that they may possess a certain amount of protection against the assaults of torpedoes and the dangers of the rams.

*The Third Series of Fighting Ships.*—This includes the numerous small craft (sloops and gunboats) whose duty it is to represent the power of England in every petty port, keeping order, supporting justice, preventing piracy, and making the country's name known everywhere. An Officer commanding a German man-of-war which was making a tour of the world, remarked a short time ago, in a tone of great surprise, "I have seen the English pendant in every port I 'have visited.'" *This* is what promotes the power of Great Britain; it



shows every nation and people that England's authority is not only represented by Ministers and Consuls, but that it is supported by forces which are not to be despised. For it is known that the small craft only represent a fraction of a considerable force. The mere presence of this fraction in uncivilised parts of the world has often prevented a disturbance which would otherwise have broken out. Sloops and gunboats are indispensable to England, and their duties are so numerous, that they must not only vary in size, but also in description; some being fast and of deep draught, others being shallow and of less speed, useful for river warfare; all well armed; and the larger ones, those of 1,000 tons and over, being fully and serviceably rigged, so as to economise fuel and afford instruction in seamanship, as well as to have the power of moving from port to port, when it would be impossible to ensure the smaller vessels making the requisite passage. To explain minutely each of the numerous classes composing this series, would take more space than could be afforded in this essay.

*The Fourth Series of Fighting Ships.*—Our ironclad, or first-class of vessel for coast-defence at home and abroad, should as nearly as possible represent a floating fort, her steaming power and sea-worthiness being sufficient to ensure her safety if caught in a gale on the coast she has to defend. Sail power is unnecessary, as also great speed under steam, but her principal object will be to carry a powerful armament and heavy armour. The present ships of the "Hydra" class, and other mastless turret vessels, would do for the protection of Colonial ports, the larger ones being stationed in the Mediterranean; but should other vessels be built for purposes of our coast defence let them be constructed more on the above principles, namely with heavier armour, greater beam, less speed, and more gun-power; the latter either on a system of several one-gun turrets, or on the "Moncrieff" principle, the guns recoiling under cover of a breastwork. Referring to Table III, page 465, if such vessels were capable of carrying 1,200 tons of armament, a battery of twelve 38-ton guns would be preferable to any other, and if only to carry 600 tons of armament, twelve 18-ton guns. The improvement which is about to be instituted in the "Inflexible," of reducing the gun's recoil to a minimum, and of loading it from a loading-box outside the turret, is a step in the right direction. Let the guns then be smaller, one in each turret, and at least twelve turrets, in each harbour-defence ship. This could be managed by making the turrets a mere armoured shelter for the breech of the gun, admitting of hydraulic working trunnion-boxes recoiling at most three feet, and of the gun being given the requisite amount of elevation and depression (see Plate III), the turret being turned, and the gun depressed, so as to point to the loading-box after firing each round. The manner of arranging the guns would be as follows: the whole battery placed on a breastwork similar to that of Her Majesty's ship "Dreadnought," but of greater length and breadth in proportion. (See Plate IV.) The turntable would work in the deck above the breastwork having the hydraulic slide in its centre, the gun would then be placed on the slide working in trunnion-boxes similar to those fitted for Her Majesty's ship "Inflexible," and afterwards the

armour shield of the turret would be placed over the breech of the gun, and bolted securely, this part being removed when necessary to move the gun. The guns would be laid "by director." These guns would not only have the advantage of great number, but also of an immense arc of training. By sacrifice of speed, a vessel of this description would be constructed with such beam as to allow of her carrying great thickness of armour, which would adequately protect the guns, the ship still being safe as a floating body.

Flotillas of gunboats, each carrying one heavy gun, and supported by small swift torpedo vessels, would complete our coast defence. The former are well represented by the present class of such vessels, and the latter, Mr. Thorneycroft's launches, have brought into notice the marvellous speed that can be attained by these small boats, but the authorities will hardly be contented with a craft so slight and delicate as the "Lightning;" a boat rather larger and more substantial, with a speed of perhaps 17 knots, would better answer our requirements, and we must insist on her possessing a greater power of turning and manœuvring. We will conclude Part II with a few observations on the ships that may be considered our supplemental force.

Mr. Thomas Brassey, M.P., has strongly advocated the desirability of employing armed fast merchant steamers to supplement our Navy, should their services ever be required. The late Mr. W. S. Lindsay, another great authority on such a question, writes in a very instructive and able article in the "Nautical Magazine," December, 1876, proposing to make steamers of 1,200 to 3,000 tons burden, capable of carrying two 7-ton, or four 64-pounder guns; and names the cost of doing this as from 700*l.* to 1,200*l.*, which of course it would be necessary for the Government to defray. By such means a choice from several hundred magnificent steamers might form a reserve of material value, and these vessels will do good service against the enemy's light cruisers and vessels that annoyed our commerce, besides being handy for carrying troops, or, where it was urgently required, coal and stores to our fleets. This would give employment to the Officers of the Royal Naval Reserve, and to many retired Officers who would doubtless be most energetic in putting their full ability into their duty, and with the help of guns, torpedoes, and the great speed of their ships, do good service at little comparative risk to themselves.

Captain Baranoff, of the Russian Navy, so urged his theory of employing armed merchant steamers against even ironclads, that his Government permitted him to arm and put to sea in a vessel named the "Vesta," which, though uncaptured, soon had to retreat when engaged by a Turkish man-of-war, and trust to her superior speed for her escape. This vessel was armed with mortars (most uncertain weapons when fired from a moving platform). Our supplemental ships will not be required to engage ironclads; but will be so *found* that they need fear no cruiser that does not equal them in speed.

Table IV gives a summary of the principal weights to be considered in the construction of the different classes of ships-of-war; also the nature of their armament, and armour protection as proposed in this part.

TABLE IV.—*Descriptions of Fighting Ships.*

No. of series.	Nature of Vessels.	Certain weights as fractions of displacement.				Example vessels.					Armament.		
		Arma- ment.	Coal.	Hull, &c.	Total tonnage.	Division of weight.				Guns.		Nature of bow.	
						Arma- ment.	Coal.	Hull, &c.	Arma- ment.	Coal.	Hull, &c.		No.
1st...	Sea-going ironclads .....	.225	.1	.125	.55	Tons. 1,800 9" to 12" 1,100 7" to 10"	Tons. 800 500	Tons. 1,000 600	Tons. 4,400 2,800	12 4 12 4	18-ton " " " " " "	Ram. " "	
2nd ..	Large cruisers .....	.06	.08	.16	.7	300 5'	400	800	3,500	2 16 8	12-ton 6½ " 64-pdr.	Ram.	
	Special cruisers .....	0	.03	.2	.77	120 4" 0	160 90	320 600	1,400 2,310	20 10	64 " 64 "	" Up and down.	
3rd...	Small cruisers .....	0	.05	.1	.85	0	50	100	850	12	40-pdr.	Ordinary	
4th...	Coast defence, ironclads.	.28	.12	.1	.5	2,800 12" to 18" 1,700 10" to 15" 0	1,200 700	1,000 600	5,000 3,000	12 12	38-ton 18 "	Ram. "	
	Gunboats .....	0	.15	.1	.75	0	45	30	225	1	18 "	Ordinary	



PART III.—*Organization required to secure a powerful and economic Imperial Naval Force.*

The organization of the Royal Navy will include the entry, training, and employment of the seamen and marines, with their Officers, who comprise our regular sea forces.

*The Officers of the Royal Navy* are divided into the executive, or combatant, and the civil, or non-combatant. But as the executives have most to do with this part of our discussion, we will devote our time principally to them, and examine the requirements needed, in order that our ships may be efficiently officered and commanded. Comparisons are frequently drawn between Officers commanding our men-of-war and Captains of merchant vessels; and it is sometimes hinted that the latter are of the two more competent to manage their ships. This *may* be the case, but let us just compare the duties that each has to perform. The average merchant steamer is commanded by a man whose employment has been of the same nature the greater part of his life. He probably serves in vessels that make passages on the same route, year after year; and it may be that he has served in a junior capacity on the same line of traffic before obtaining a command. He has little or nothing to do but to navigate and take care of his ship; he has the assistance of pilots on every occasion where it is the least necessary, and his track on the ocean is often laid out for him before leaving England.

The Captain of a man-of-war has to be ready to take his ship to any part of the world, and to do any duty that may be required of him, whether on diplomatic or warlike service. He has to enter ports strange or otherwise, and to make passages with which he may have no acquaintance. He has to manage his ship as part of a squadron, and manœuvre in all sorts of intricate evolutions, and in addition to this he has innumerable duties to attend to in order that his ship may at all times be thoroughly efficient and ready for service. The merchant Captain, running his regular route, may possibly be more competent to keep his ship out of danger; he may possess equal ability, and as the duties required of him are fewer and of a simpler nature, he is probably more experienced in them.

In the same way the engineers of the mercantile marine, as compared with those of the Royal Navy, have every advantage; they are often, if not always, brought up to manage the engines that they have to work on board ship, they have the same duties year after year, and the same description of machinery to deal with. Being thus constantly employed, who can wonder at their becoming adepts, and ensuring by their great experience the perfect working of their engines, thus securing to our merchant steamers that marvellous power of performing long passages, sometimes at an enormous speed, with rarely a check or accident? Our naval engineers are liable to be changed from one ship to another, seldom finding the engines they have to work alike in two cases. Sometimes they are employed in ships that are rarely under steam, at others in a mastless vessel dependent on her engine-room for nearly all the work on board, having, perhaps, thirty different sets of engines.

These Officers may have the opportunity for visiting the numerous factories where engines and machinery are made for the Navy; but there being no established system of constructing engines for the Navy, it is impossible for them to be brought up to their work in the same way as the mercantile engineers.

To return to the executives. An executive naval Officer to be perfect must be indeed a marvel. He should combine wisdom with prudence, energy, and decision. He should possess nerve, coolness, fearlessness, and the strongest sense of honour. He should, of course, be thoroughly *au fait* in all that concerns the Navy; intimately acquainted with all the interior arrangements of his ship; readily adapting himself to changes, which in these days are numerous and intricate; fully conversant with the science of working and mode of using the guns and arms in action, whether on board ship, or with seamen on landing or other expeditions, having a commanding knowledge of all the steam and other machinery on board. He should be experienced as a seaman, an adept at handling his vessel under any and every circumstance, understanding modes of signalling and manners of manœuvring in fleets; he should be an able and trustworthy navigator, capable of managing his ship in dangerous waters with a free and firm hand—not so much with “caution” as with boldness and confidence, coupled with masterly knowledge. He should be experienced as a disciplinarian, must know sufficient of the law to qualify him to be an able magistrate, and to preside over courts-martial, naval and prize-courts. Above all he should be a sound diplomatist, able and ready to use his discretion, and accept responsibility on the most important questions, and this often as quite a junior Officer. The knowledge of foreign languages is most desirable if not actually necessary, and the power of writing good despatches very important.

No other service requires that its Officers should possess such numerous qualifications, and therefore naval Officers must be trained and selected for promotion with the greatest possible care, no expense being spared and every encouragement offered to induce them to put their whole mental power into the work of acquiring professional knowledge and ability.

The question now arises “How are we to get the nearest approach to this description of a perfect Officer; how should his entry and training be organized so as to produce the most satisfactory results?” To begin with, we cannot be too careful in our choice of the boys to be entered. The system of nominations and entry examinations should be such as to ensure none but those who promise well ever putting on naval uniform. Nominations being accorded only to young fellows who show themselves fitted for the Navy, high-spirited promising lads, with a sense of honour and goodwill that in manhood will make their country proud of them; and the examinations selecting from these those who are talented and industrious.

At the age of twelve it is barely possible to form a correct estimate on either of the above points. A well advanced boy at that age may be a dunce at fourteen, and *vice versa*; we neither want to lose the boy who will be worth having at fourteen, nor do we want to keep the

youth who has been forced for his examination and proves worthless when two years older. We would, therefore, most strongly insist that it would be for the benefit of the Navy if cadets were entered two years later, between the ages of fourteen and fifteen; and then by a perfected system of issuing nominations, and arranging the examinations, ensure their being what we want, viz., boys physically and socially fitted for the Navy, and by nature practical mathematicians. A carefully devised examination comprising many subjects, but, with the exception of Latin and French, all of a practical nature; and if it is practicable with questions arranged especially for the occasion, and not from any given series of books would, we believe, ensure this.

It requires a mathematical mind to organize a fleet, to dispose of and manœuvre ships in an action so as to gain advantage over the enemy, also in order to perform all and any of the innumerable duties that fall to the share of the Officers of Her Majesty's ships, from rescuing and saving vessels from wreck or danger (such as the hauling off of Her Majesty's ship "Gorgon," after being stranded in the Bay of Monte Video, May 10th, 1844, by Captain Hotham and his Officers, a feat which will remain an everlasting testimony of the mathematical skill and perseverance of Englishmen) to the simple methods of hoisting weights in and out of a ship. All are mathematical applications of power which require skill in order to be efficiently worked, the secret being *economy of force*; waste of power, or the effect of not using it to the full of its advantage, may occasion the loss of an action or any other disaster. A boy who can handle a practical problem skilfully, whether in algebra, Euclid, or trigonometry, though it were quite strange to him, would probably, as a man, handle a ship under exceptional circumstances with equal skill. Both are, of course, the result of experience, and skill as a seaman might be obtained without the knowledge or study of mathematics; but the possession of this knowledge is of the greatest service in all the acquirements of a naval Officer, and it is probable that all real seamen have ingenious or mathematical minds, though themselves unconscious of possessing such a qualification.

To proceed then: enter boys who can pass the foregoing tests between the ages of fourteen and fifteen, all capital young fellows with the rudiments of mathematics well instilled into their composition; send them to a training ship or college for six months, there to learn how to apply their mathematical knowledge to naval subjects, at the same time giving them an introduction into the Navy, an opportunity of boating, bathing, and seeing what a man-of-war is, learning sea terms, and having free use of the ship's masts as part of their playground. After this send them to sea in training ships, of about 1,800 tons, for six or nine months, there to learn the manual of seamanship, namely, what a ship is, how rigged and worked, and all the minutæ of detail in service fittings and arrangements. Examinations will take place at the end of each of these periods, at which the cadets will be awarded sea-time according to their merit, as on the present system. Having passed the final examination satisfactorily, a boy will be appointed to a sea-going ship, as midshipman, there to learn his duties



as a naval Officer, great care being taken that every opportunity be afforded him to study every branch of professional work. After completing three and a half to four years at sea (from the time of leaving the training ship), according to the amount of time gained by examinations, and provided that he is nineteen years of age, he will be required to qualify for the rank of Sub-Lieutenant on a system of instruction and examination similar to the present.

By this plan the periods of instruction in different subjects would be definitely divided; first, a good schooling in general mathematics and other school subjects, giving time to root itself in the boy's mind; second, a short period during which he learns to apply this knowledge to a practical purpose, namely, its use in sea-life; third, another short period, when his principal time is employed in learning the manual of a seaman's duty (this would be quickly mastered by boys of from fifteen to sixteen years of age, who were necessarily mathematically disposed); and, lastly, three and a half to four years in learning the duties of a naval Officer, everything else being made subordinate to this one requirement. A well-organized and strictly adhered-to system of bringing midshipmen up to learn their duty in charge of boats, decks, masts, and parties of men, and as they gained seniority, the duties of working the ship and batteries of guns, would secure this end; the midshipmen being constantly under instruction in such matters, and the time for school, only sufficient to enable them to keep up former knowledge. At present, on board a sea-going ship, school appears to be considered of the first importance, and indeed since the examination at Greenwich makes or mars promotion, it is only naturally so; but if boys were well grounded before entry, and lived in an atmosphere of practical mathematics from the age of fourteen and a half to nineteen or twenty, nine months' real study at college should prepare them for an examination equally as difficult as there is at present, and the results we believe would be even better. Anyhow, we should obtain a nearer approach to the required standard naval Officer than we are likely to do at present.

There is one other word to be said before we leave this part of an Officer's career. As a midshipman, and afterwards as a Sub-Lieutenant, professional ability should be carefully noted and reported to the Admiralty, and this should go a long way towards qualifying an Officer for early promotion to Lieutenant's rank. The present system of certificates is not sufficient to meet this end; it would be better if they were issued yearly and supplemented by fuller particulars as to ability shown by the Officer in his different duties, and then certified by the Commander or Senior Lieutenant and the Officer of the watch, or Lieutenant who has had most to do with the young Officer, as well as by the Captain of the ship. This we mention because it often occurs that the Captain has not the opportunity of forming a good estimate of the younger Officers. They may be a very short time with him, and they are probably on their mettle when he sees them at work.

In the foregoing an alteration is proposed in the present system, as far as the age of entry and the speciality of the training of cadets and midshipmen is concerned: after this period it would be difficult to

improve on the general principles of training that are now working themselves into order, and that made such grand advances when Greenwich College and the torpedo schools were instituted. For junior Sub-Lieutenants, the gunnery and college courses are admirable, and tend to bring our promising men to the front. As junior Lieutenants the short course of gunnery and torpedo, and a term at college, should complete an Officer in the rudiments of professional qualifications.

The days of Gunnery-Lieutenants are undoubtedly numbered; all Lieutenants should be fully acquainted with the drills and duties on board, and the only special men will be a few who have shown great ability, and will undergo a long and comprehensive training to qualify them as gunnery and perhaps torpedo Staff Officers.

The period of service as a Lieutenant is the real test of an Officer's worth; it is in this grade that he should prove himself worthy of advancement or otherwise. Men who have shown neither ability nor wish to work, must be content to make way for others. Men who are anxious to do well, but who are not naturally talented, must also give way to the requirements of the Navy; for we must have able men, who are in every way fit to command, and to act promptly and judiciously under the most trying and difficult circumstances. Hard-working Officers, who fall short in these requirements, should be most carefully treated, and it is desirable that their otherwise good services be rewarded as adequately as possible. To promote some of these, and to give them responsible appointments that they are not fit to hold, would be doing an injustice to them and to the nation, but they may be constantly employed, and eventually retired on a very liberal scale. The retirement scheme of March, 1870, was admirable in this respect; the amount increased with the length of service in any rank, and therefore an Officer who had served well but who had not been so prosperous in his career as his more brilliant colleagues, is well provided for, whereas those Officers who advance rapidly receive rank, but are not induced to leave a service (that appreciates and wishes to retain them) by offers of good retirement. The system of promotion should be founded on these principles: encourage the ablest Officers to put their whole energies into their work, and so mount the scale as quickly as possible. Encourage those less gifted to work well and so earn honours next to the first. Encourage Officers of average ability to form the backbone of the Service, holding out the certainty that their services will be adequately rewarded, if not by promotion, at least by a liberal retirement; encourage Officers of less value to serve for similar retirements; and let all others who are more or less a hindrance, and have in fact mistaken their profession, understand that they had better make way for better men.

This may seem very arbitrary, but with the interests of the Navy and the honour of the country at heart, the service must unflinchingly resort to a system of this kind. The naval members of such a permanent council for naval administration as I advocated in Part I, could make the selection of executive Officers for promotion and advancement a part of their special duty, and this able and influential

body would doubtless do justice to all Officers. Captain Needham, R.M.A., speaking of the French Admiralty Council, says, "On the one hand it advises on all measures relating to the general administration of the Navy and colonies; on the other hand, in its character of an impartial judge of the services and merits of every Officer, it prepares each year the lists by which promotion in the several branches of the service is governed."<sup>1</sup> We have here a lead that it would be well to follow.

By careful entry, effective training, and then just selection, our higher ranks should be supplied with the most accomplished seamen and Officers that the world possesses. For the last twenty years naval Officers have been in a transition state, seamanship has been neglected for what is erroneously called higher science, and the rapid introduction of one improvement after another in ships, guns, and arms, has rendered any systematic training most difficult. Hence, they have lost in the principal essential, "*seamanship*," and have gained comparatively little in other matters, owing to the innumerable and rapid changes.

Let us hope that the young Officers now entering, and about to enter, may reap the full advantage of former experience, that they will find their career more clearly laid out for them; the training more suited to the requirements, and every facility given them for obtaining the maximum of professional knowledge; for it seems impossible that changes in future should be so great and constant as they have been of late.

*The Navigating Branch.*—The Admiralty circular, dated March 27th, 1877, on the abolition of this as a separate branch of the Navy, brings to an end the question which has for a long time occupied the thoughts of naval authorities; that it is a wise decision is unquestionable, for it is impossible in these days to keep able and experienced men in a low grade of rank for long periods, and so let the service benefit by them without offering an equivalent return. The "Master" of former days was an experienced old seaman, who often had more knowledge of the sea than anyone on board, and was to be fully relied upon; but of late the Navigating Lieutenants have been much younger men, and sometimes of even less experience than Lieutenants of their own seniority. Besides this, boys entered for the navigating branch were bound to become Navigating Lieutenants if they remained in the service, whether they had taste and ability for those duties or not; whereas, choosing men for navigating duties from the Lieutenants and Sub-Lieutenants list, you are sure to secure the services of many Officers, who show natural talent for navigating and piloting ships; we may, therefore, rest assured that these Officers are perfectly capable of relieving the Navigating Lieutenants and Sub-Lieutenants, and of performing their duties with equal skill.

We next come to the question of how to provide a proper substitute for the admirable and highly experienced men constituting our present list of Staff Commanders. These Officers resemble the "Masters" of old time; they have spent their lives in the performance of one par-

<sup>1</sup> See "Journal," Vol. xxi, No. 91, p. 856.



ticular duty, gaining immense experience and ability, and are consequently invaluable. We shall undoubtedly lose by the abolition of the navigating branch in this one respect; it will be difficult to find substitutes for them, wherever they have been employed, especially in the case of flag ships, where the navigating Officer is expected to do squadron work, and is in a way responsible for all the ships that are in company. This last appears to be the sole case in which a Commander, who has been promoted for his services as a navigator, might still be employed in that capacity; he should then be appointed on the Admiral's staff (in addition to the "Lieutenant for navigating duties," belonging to the ship), to conduct all squadron work, carrying out the Admiral's wishes on all questions of navigation, evolution, taking up berths in harbour, surveying stores, &c. It will not be found possible to employ Commanders for navigating duties on board other ships; for it is only right that they should be entitled to commands of their own, either of surveying vessels, if fitted for it, or others, and so return to their regular duties in the same manner as Gunnery Lieutenants when promoted.

*Engineer Officers.*—The next Officers of executive importance in the navy are the engineers; they are classed with the civilians, but their duties are more nearly allied to the executives.

The Chief Engineers now in the Navy, amongst whom we find many able men, all entered when steam was an auxiliary, and only considered valuable as such. These Officers were not particularly benefited by having been obliged to serve many tedious years in the junior ranks; and now, before they are of sufficient seniority to be appointed to the most responsible posts, in many cases their age is such that energy and abilities are alike impaired, and they are, with few exceptions, unequal to the task. Again, these same Officers were advanced in relative rank, and in receipt of higher rates of pay, with the increasing importance of machinery, but the whole class has not kept pace with the requirements of the times; we want our engineers not only to work the ship's propelling engines, but also to materially assist us in the building of ships, the construction of engines and machinery, and on board ship to be capable of managing and superintending all the intricacies of gun-machinery, water-tight compartments, and pumps, and in fact the good repair of every part of the vessel that comes out of a factory.

Plans are now being tried for improving the class of engineers, but great difficulty is found in keeping men who prove themselves valuable, because there is such a demand in the country for good engineers, that students who promise well are bought out of the Service, or leave it, in hopes of getting more profitable employment. Valuable men, no doubt, command a very high rate of pay—or other advantages—and the country must be ready to give it to them. The corps would much benefit by the abolition of promotion by seniority, and the institution of promotion almost entirely by selection. The system of promoting Officers, capable or otherwise, to the higher ranks and rates of pay, is most injurious to the Service; let every rank be filled by selection, and let this selection be the result partly of

examination, partly of strict inquiry and recommendation. By these means there would be a better chance of retaining the services of good Officers, and these would be rapidly brought to the front. Earlier in this part of the essay, we mentioned, among the difficulties that naval engineers have to contend with, "the enormous variety of engines they have to work"; this can only be overcome by Government taking in hand the manufacture of machinery for the Royal Navy, and establishing an enormous factory which will provide engines for every class of war-vessels, and at the same time be a school in which our engineers will be brought up to and perfected in their work. Woolwich Arsenal produces the finest guns in the world; such another Government Institution should produce the best engines in the world. Contractors have failed so often of late, in the engines they have put into men-of-war, that they can have no reason for expecting the country to retain full faith in them. The establishment of such a factory would, therefore, be a wise and popular step, as well as one of inestimable benefit to the Navy, both in furnishing engines more uniform in character, and in providing for naval engineers a school of instruction.

If we look across the Channel we may learn a good lesson on the subject of engineers; the French have been much more prudent than ourselves. From the beginning they have employed very few Officers, and have trained their *mécaniciens de la flotte* (men in the position of our engine-room artificers) to take charge of the engines of nearly all ships, there only being an Officer of the maritime engineers (*mécaniciens principaux*) on board the flagships and other large and important vessels; the whole number being fifty, namely, two *mécaniciens en chef*, ranking with Commanders, eight *mécaniciens principaux de 1re classe*, and forty *de 2ième classe*, ranking with Lieutenants and *enseignes de vaisseau*; in addition to these, and attached to the Navy, they have the *corps du génie maritime*; who, while occasionally being employed with the fleet, have the superintendence of everything that concerns the designing, building, and repairing of vessels of war; men of superior ability, recruited from *l'Ecole Polytechnique*, and rising to a rank and rate of pay corresponding with the higher Officers of the Navy.

We are at present employing a most useful class of men, namely, the engine-room artificers, and with due care they may be trained to fulfil all the engine-room duties on the French system. But, unfortunately for the Navy and for the Officers themselves, we find an overstocked list of engineers, valuable in their way, but too good for ordinary engine-room work, and with few exceptions, not of the requisite training and experience to perform the higher duties of the department. We want well-trained engine-room artificers and—comparatively—a few exceedingly skilful engineers; of the former we have already a large number, which, however (if they are intended to take charge of the engine-room), will require to be increased, and to obtain the latter at the requisite age, we must begin anew.

Should the reforms now under trial for the improvement of this department fail, there is another plan which might be tried: it would

be easier to obtain the services of a higher class of men, if they were exempted from the drudgery of service in the lower ranks, and this might be done if Government were to enter men of good position, who, during ten years' experience, had proved themselves thoroughly able and skilful as civil as well as marine engineers, who, after one year's qualifying in a naval dockyard or factory, would be placed on board a ship in charge of all the engineer department, receiving high rank and pay. In this manner a school of men might be started, who, at a future time, would vie with executives in the question of importance to the Navy.

Some plan might be devised of engaging the services of these gentlemen for stated periods. They would look forward to rising in importance according to the ability they showed, until their position nearly approached that of the first Officers of the Navy; and surely no one would begrudge it to them, if they were gentlemen of unquestionable skill and experience in the department of all others the most important to the well-being of our ships of war.

We ought to have the best engineers to construct and work the engines of, and to design, build, and repair our ships; and the best of executives to command, manœuvre, and fight them.

It will be found difficult to bring up and educate engineers of a higher class for the Navy, and to keep the ablest of the men we go to such an enormous expense to train; whereas, if *we* do not train them, we can afford them much higher rates of pay when fully trained. Should this plan be ever entertained, the present engineers will have to be gradually pensioned off, after the manner of the navigating branch; the ablest men who are not too advanced in age being retained, and perhaps placed on the new footing.

*Paymaster Branch.*—We will pass over the remainder of the civilians of the Navy, with only a few words on the commissariat, as some ideas have occasionally been put forward of abolishing paymasters. We shall never be able to do without this valuable and important branch, but it might be an economy to the Service, and a benefit to both the Navy and the Officers it assisted, if a few paymasters' commissions were yearly given to executives who had shown themselves to be more fitted for office-work than for a seaman's duty, and could pass a requisite examination: fewer entries would then have to be made in the paymaster's direct line, and the whole branch would eventually become of more value as combatants, for they should certainly be required to assist in executive duties in times of emergency, when every Officer and man on board must make himself, to a certain extent, useful as a combatant. Officers of this branch have, on many occasions, proved themselves by no means behindhand in daring and aptitude for any work that may be required of them; let their use on such occasions be encouraged, and their value will be materially increased. In the office they are invaluable; we *must* have office-men, but let us hope that "instructions, and regulations," and other work they may have to do, may be kept as simple in form as possible, and all avoidable paper-work be dispensed with.

*Employment of Officers, and their Leave of Absence.*—Speaking



generally, the system of employment for Officers is satisfactory: to find employment for them in time of peace will always be a difficulty, but with the help of the Royal Naval College, and the Gunnery and Torpedo schools, work is found for some of those who cannot be given sea-going appointments, and, apart from this, a few months on shore does no harm to an active-minded man; there are plenty of subjects for him to study, and plenty of things for him to see, that will enlarge his mind, and give him insight into what is going on in the world; thereby strengthening his common sense and benefiting him generally. The continual service at sea, which is looked upon by many as so important, tends to keep an Officer from ventilating his mind, and narrows it into a groove, which detracts from his general ability.

As regards leave, let it be an understood thing in the Service, as it is now under some Admirals, that Officers abroad be encouraged to visit all places of note and interest within reach of their ship; the necessary amount of leave being freely given. A system of one month's leave on full pay at home, for each year's service abroad, or otherwise, would be hailed by the Service as a great boon. Admiralty liberality does much for the good name of the Service, the reverse does much harm; to keep our best Officers and men, we must look after their wants, and humour them; so all liberal acts are worthy of consideration.

*Seamen of the Royal Navy.*—The organization of this portion of our naval service is on a more satisfactory footing now than it has ever been before. But as all things are slow in perfecting themselves, and seldom attain real perfection, so there are points where alterations might facilitate matters, and render the training of men—so as to qualify them as able seamen and gunners—less laborious and expensive.

At present (quoting from an instructive lecture delivered by Captain J. C. Wilson, R.N.)<sup>1</sup> we have an average yearly entry of 2,727 boys (nominally 3,000), and this furnishes the Navy with seamen as follows: 5,104 petty officers and leading seamen; 7,513 A.B.'s; and 6,416 ordinary seamen; in all, 18,673, of which he says 18,050 are continual service men.

The training of boys is admirable in nearly every respect; the training of seamen is satisfactory, and, considering the amount required of them, petty officers, though often too young, are as good as can be expected. Taken as a whole, the present system works capitally, and its principles should be strongly adhered to.

Now as regards the entry, the late Mr. W. S. Lindsay, in some valuable articles<sup>2</sup> on our maritime defences, &c., advocates the desirability of the Royal Navy so acting in harmony with the mercantile marine as to secure reserves of seamen, and wishes Government to undertake the original training of 6,000 boys, on the plan of the Industrial and Reformatory school vessels; then to have the choice of a few who would join the Royal Navy as boys, the remainder being bound to serve from the age of sixteen to twenty as apprentices in the merchant service, and from twenty to twenty-three as seamen in the Royal Navy;

<sup>1</sup> See "Journal" of the Institution, Vol. xix, No. 83, p. 604.

<sup>2</sup> "Nautical Magazine," August—December, 1876.

after which age they would have the choice of either service as their employment. He thinks that this would admit of naval training-ships being dispensed with, and would provide able seamen for all the country's wants, imperial and mercantile. It is undoubtedly important to the Royal Navy that the merchant service be well provided with able seamen, from whence to draw the Royal Naval Reserves, and the system of bringing boys up to sea life, and to be under discipline in the manner proposed, would be alike beneficial to the Government and to ship-owners. Let Mr. Lindsay's proposition be met half-way, and Government further endow the admirable institutions of school-vessels, and then have the choice of boys as they attain the age of sixteen; such boys passing one year in the Royal Naval training ships instead of two; other boys (to complete the number required) being entered and trained as at present. It would be a dangerous experiment intermingling the two services to any great extent, and the plan of all apprentices, after four years in the merchant service, being sent for three years into the Royal Navy would never answer, for we should find it fatal to the discipline of the latter. Difficulty enough is experienced in controlling the ordinary seamen at this age, entered on the present system, and this would be greatly increased if the men had been under different and less strict discipline for the four previous years.

We have enough seamen perhaps for our present requirements; but it would not be too much to ask of the British tax-payer, if we put down the number of boys yearly to be sent to sea from the home training ships as 3,000 (that is an original yearly entry of about 3,500), this would bring the total number of seamen proper up to 20,000, which is ample for our Navy in times of neutrality or peace. Looking at the manner in which the 60,000 persons provided for in the Navy Estimates is made up, it is surprising to find how few are actual seamen, for of the 29,000 mentioned as the number of petty officers and seamen, about 4,000 are stokers, 3,000 artificers, and 3,400 domestics, leaving only 18,600 seamen proper. This is the only section that requires special and elaborate training (and it should be increased to 20,000 men).

It seems really absurd to compare this number with the legions of men trained for the principal defence of foreign countries; surely we can afford to perfect our seamen, whatever the individual expense. The most important of all training is that of seamanship, that is, the whole work of a seaman at sea, on board ship, and in boats. Once let a man prove himself a good seaman, and you will find that he adapts himself to every kind of work that requires activity, coolness, and courage, ingenuity, handiness, and neatness; our smartest petty officers and upper yard-men make the best gunners; they are generally men who take pride in doing everything well, from keeping their dress neat, and the guns and gear in their charge in perfect order, to working their guns with precision and smartness, and being exceptionally ready and expert in all work aloft, whatever the danger or difficulty. Such men are not to be matched in the world; in addition to being activity itself, their whole training tends to render them fearless,

generous, and fit to cope with every possible difficulty. For a top-gallant yard-man on a stormy night (especially when his ship has to keep station in a squadron) is often aloft and alone at his work, contending with the elements at the momentary risk of his life. Such is an example of a seaman's training and employment. The greater number of these splendid fellows we can get the better for the Navy. We should therefore give every one of the youths entered the opportunity of proving that he possesses the admirable qualities of a true seaman. Drill and work need not be made a labour to any but the lazy (who should be made to make up their share of work by doing duty in extra hours). But drill with sails and arms is part of a man-of-war's man's life, and is to him the "food of efficiency." Let seamanship be the first and special requirement of all the sailors of the Royal Navy, taught in all ships, and particularly so in sailing squadrons of instruction.

Following this comes the training in gunnery. At the beginning of this century the science of gunnery was unknown. In 1804, the corps of Royal Marine Artillery was instituted, and for many years supplied the only trained gunners on board ship. About forty-six years ago, the Naval School of Gunnery was formed, and the "Excellent" has since been a permanent establishment, reinforced some years afterwards by the "Cambridge," for the accommodation of Plymouth men. These schools have turned out men who have proved themselves more fitted for working guns on board ship than the Royal Marine Artillery men, principally owing to their having been obliged to qualify as able seamen before being allowed to go through the course of gunnery instruction.

When men were entered from the shore as novices, and from the merchant service, it was necessary that a special training should be given, in order to ensure some of them being capable of executing the gunnery duties, and giving instruction in drills, &c.; but now that every man is entered and trained from boyhood to his duties in the Navy, special gunnery training might be dispensed with, save in the case of a few, who have shown great aptitude for gunnery duties, who should be allowed to qualify as instructors.

The present school of gunnery has its weaknesses; it inaugurates a system of making a distinction which should not exist, for now-a-days every seaman should be a gunner, and not only a special class of men; and from boyhood a seaman in the Royal Navy should look upon a rifle (and its sword bayonet) as his weapon, and learn to be as free in handling it as a sportsman is his fowling-piece. Again, when we think that the whole science of gunnery resolves itself into loading and laying a gun quickly, and firing it accurately, surely any intelligent man, well under discipline, can learn his duties without much difficulty, how much more easily should efficiency be attained if, from their entry, seamen were brought up to the general principles of gunnery.

A drawback to systematic training appears to exist in the want of uniformity in the disposal of seamen, which, under present circumstances, is unavoidable, but we would suggest that by the establishment of naval barracks in our principal dockyards, this difficulty



would be overcome. Barracks for seamen have been advocated by nearly every writer and lecturer on naval subjects, and if it were not for the expense of the buildings, we should undoubtedly have had them long ago. There appears only one thing against their being established, and that is the feeling that it might be the thin edge of the wedge for opening a way towards the recognition of seamen's and Officers' wives by the Navy: but this would never be thought of, if the barracks were built *in* the dockyards, and arrangements for leave conducted in the same manner as on board Her Majesty's ship "Excellent."

Training ships and brigs are, undoubtedly, best for boys; but after that part of their training is over, let them, on all occasions, return to the barracks, and there undergo instruction in all branches of gunnery and seamanship, as well as forming working parties in the dockyard; moving vessels and other duties of the same nature (now performed by the artificers of the dockyard at a great loss of their time). All the men should be placed on a regular roster and drafted off to ships as required; those about to be sent to any new class, or experimental ship, being specially trained to the working of their particular guns. Much is taught on board the present gunnery ships that is not necessary for *all* seamen. It would be better to bring our men up to master what is really of value to them, simplifying all drills to the last point, and making all our able seamen perfect in them. What is the good of teaching parade movements to blue-jackets, because they happen to be armed with rifles? There should be a practical field exercise for the Navy free from all such unnecessary complications. Let well-disciplined men be perfect in the use of their arms, and the knowledge of how to move in fours and in quarter column, and how to form line, and to skirmish is all that will ever be required of them as part of a naval brigade on active service. The waste of time on board ship in tedious barrack-yard goose-step, or squad drills, is a curse to the Navy; as though we had not enough useful work for seamen to learn. Regiments of infantry have nothing else to do but to perfect their men in one subject; complications are made in order to give steadiness and exercise ingenuity, and manœuvres to prove efficiency on parade; but no parade movements would be used on the field of battle. Men in the Navy should be all riflemen, in addition they must be ship-artillerymen and swordsmen, but above all they must be seamen; the sole aim of all instruction being readiness for action, accident, or relief of disaster.

Let there be an able gunnery staff (provided with every facility for teaching) at each naval barracks, and let every seaman in the Navy be brought up as a gunner and rifleman, rifles being supplied to the men and kept by them for the time of their service (as with the marines): let it be an understood thing, that during the six months or so which every man would have in barracks after a three years' commission, he should be fully instructed in all changes that may have been made in gunnery, and thoroughly prepared for the ship he is about to join.

In the first three years of service as ordinary seamen, regulations

should admit of their having at least one year in ships set apart for special training in seamanship; but as these men are required in the Service, to fill up our ships' companies, we cannot afford them a longer period. Able seamen and gunners form the backbone of our Navy; these men, after careful training, should be encouraged to qualify for petty officers, and these again to work their way on to become warrant officers, if found deserving and capable of doing the duties.

The late circular, granting an increase of pay to men who re-engage for an additional ten years, is undoubtedly good policy; but in these times, when seamen calculate their prospects so closely, we shall still have difficulty in getting back some of our steadiest men, for so many opportunities are open to really good men, in the railway companies, police, and fire brigades, where, if they behave well, they get more than compensated for the loss of their naval pay and pension. The late First Lord of the Admiralty, in a speech on the Navy Estimates (March 14th, 1877), put the loss of ten years' men down as from 25 to 35 per cent.; he stated, in the same speech, that of 100 boys entered, 88 became ordinary seamen, and 40 completed ten years' service.

We want to retain good men and to get rid of the worthless, and should, therefore, begin by getting picked boys, carefully weeding out those unfitted for the Service, before too much has been expended on their training. We should then facilitate the exit of men who turn out badly and prove lazy, good-for-nothing fellows, or insubordinate, and uncontrollable. A practice is supposed to exist of men who wish to get off their engagement and leave the Service, purposely committing offences so as to be discharged as useless or incorrigible; this might easily be prevented by trying by court-martial, and committing all really worthless characters to imprisonment, not exceeding one year, before discharge from the Navy. The more we prove to our seamen that undeserving men will not be tolerated, or allowed to remain in the Service, the more certain we are of getting and retaining respectable and able men. It often occurs that a dozen young scoundrels give more trouble than all the rest of the ship's company, annoy both Officers and petty officers, and are a continual worry and bother, earning neither their food nor pay, and always under punishment. At one time the cat kept such men in order, but now it should be the fear of imprisonment together with discharge. Drills should be regular, and in all cases repeated if not satisfactory, but we should guard against giving unnecessary work. We should make the comforts of our men one of our first considerations, encouraging cheerfulness and content in all the duties a seaman has to perform.

Good men know well enough when duty is required of them, and will never shirk an atom of it; for no one faces dangers, difficulties, and trouble with less depression than a true sailor, and no one is by nature more prone to work willingly and cheerfully than men-of-war's men, when they are under good discipline and *well cared for*.

The denomination of "blue-jacket," comprises not only the seaman proper, but every other person that wears the uniform. Stokers, artificers, and carpenters all come under the general term; as a rule

we find these men steady, respectable, and quite equal to the work they have to do. Stokers are subject to much the same discipline and duties whether they are on board a merchant ship or man-of-war, we shall, therefore, never find great difficulty in recruiting their numbers when required. Artificers, carpenters, and other special branches of the Navy could also be augmented with equal facility.

*The Royal Marines.*—We do not hold that the presence of the marine force is necessary for the preservation of discipline and the upholding of authority on board men-of-war. But there are military duties, such as guards, escorts, sentries, and servants to Officers, not by nature readily, or well performed by seamen, but which are exactly suited to the Royal Marines. We trust that a seaman's real duty will be ever held of the first importance, and that all attempts to turn him into a soldier will utterly fail.

The value of marines in assisting the ordinary work on board ship is incalculable, for it is generally recognised that they are, if anything, better men at hauling on ropes than the lighter and more active blue-jackets. All the men on board are not required for duty aloft, therefore the marines, who make the best deck hands, have plenty of employment.

The Royal Marine Light Infantry is a service of infinite value to the Navy; popular and easily recruited, it forms our first body of reserves, so it would be well to add to the strength of this important corps, and arrange that, in the event of war, the percentage of marines on board ship should be increased (see Table VI, page 495), in order that our usual number of trained seamen could man a larger fleet, fewer being required in each vessel.

*The Royal Marine Artillery.*—This corps, one of the finest and most intellectual bodies of men in the United Kingdom, was formed at the beginning of the present century as a "corps of naval gunners," and was of the greatest possible value as such, until seamen so advanced in intellect and training as to excel them in naval gun practice. In fact, the want, to supply which they were originally intended, no longer exists, and we find that this admirably trained and valuable set of men are required on board ship to do little more than the duties of Light Infantry Marines. It seems impossible that the Royal Marine Artillery should exist on its present footing much longer. It will either have to be done away with or else put to some other use. It would certainly be a great pity if such an able body was disbanded, and its services lost to the country. As naval artillerymen their day is over, but surely we can find other employment which will be equally suited to their intelligence and superior training.

We want a steady, intellectual body of men to master and conduct torpedo affairs on board ship, and at our colonial ports; men who have been brought up to the work and who can be fully relied upon: both Officers and men forming a complete and serviceable corps. It appears that the present Royal Marine Artillery is, in every respect, suited for this duty, and that by substituting for the duties and name of artilleryman that of engineers, or miners, a most perfect and reliable corps would, in a few months, be ready to undertake all



torpedo duties, and eventually become a valuable and highly scientific body of torpedoists. "Royal Marine Engineers" would be distributed among the fleet in the same manner as Royal Marine Artillerymen are at present, doing the same duties, only substituting torpedo work for artillery. By these means, even the smallest vessels would carry two or three torpedo men.

Officers of the present Royal Marine Artillery would be required to master the whole science and detail of torpedo work, and would be appointed to the fleet for torpedo duties; and if this number of Officers was not found sufficient for the purpose, some of the Officers of the Royal Marine Light Infantry might be encouraged to qualify in torpedo instruction, and so assist in torpedo duties, receiving increase of pay according to their qualifications. We are now instructing seamen as torpedoists, but it is impossible to give them sound knowledge in their business as such, and at the same time require of them the duties of a man-of-war's man. They do not commence their training until they are A.B.'s, and even then, if they were specially instructed to the neglect of other professional acquirements, their time of service would probably expire three or four years after they have attained sufficient knowledge to be of any practical use.

An attempt has been made to bring in the same argument on the torpedo question as that raised on the question of naval gunnery some years ago: it was then said that seamen were not capable of being gunners, and they have since undoubtedly proved that they are at least equally capable with the Royal Marine Artillery. But this does not really apply to torpedoists. If it were necessary that every seaman studied the art and had to work torpedoes, by all means let them all qualify; but this is not the case. Every seaman must be a gunner, but only a few men on board each ship are required for torpedo work. Seamen would naturally be of great assistance in torpedo boat work, but the manipulation, handling, and charge of these dangerous weapons would be infinitely safer, and torpedoes more serviceable, if entirely under the control and management of a special corps of highly-trained and intellectual men, such as we should command if we employed the Royal Marine Artillery for this service.

The authorities at the torpedo schools, surrounded as they are by scholars ardent as zealous, are not inclined to admit the blue-jackets' shortcomings; but let them transfer themselves to a corvette on some distant station, and ask to see the men who are qualified as torpedoists! *One* may be found who has passed the examinations, but he is perhaps at the same time coxswain of a cutter, second captain of a top, and captain of a 64-pound gun; how much time or brain-work can he employ in his duty as a torpedo man? There is little doubt we ought to have a special corps, and the Royal Marine Artillery are entirely equal to the occasion; their barracks at Eastney are admirably suited for the required purpose, and Langston Harbour is just the place for experiments and instruction. In this manner our object would be gained, and we should have Officers and men fully conversant with every description of torpedo, and capable of arranging defences for colonial ports, of conducting all the ways and means of clearing

the enemy's channels and of frustrating offensive attacks, as well as of working the torpedoes on board ship.

*Reserve Forces.*—The first reserve for manning our fleets are the seamen from the Coast Guard and the Royal Marines (of both corps) not employed at sea in time of peace. Of the former we have about 4,000 all admirable and well-trained seamen and gunners, but of these it would be advisable to leave one-half for duties that may be required on the coast, only to be called out for service when most urgently required. Of the latter we should have from 8,000 to 12,000, half of whom, in case of war, would at once be sent to fill up complements; the remainder held in readiness to supply men as needed.

Our next resource is in the seamen of the Royal Naval Reserve. The qualifications most necessary for this force are good character, experience as seamen, strength, and activity. If merchant seamen were entered as apprentices and thoroughly trained we should have no difficulty in getting 20,000 of them to form this reserve, which would perfectly fulfil all our wants and provide us with a truly splendid body of men in time of need. The late Mr. W. S. Lindsay writing on this subject,<sup>1</sup> speaks of the failure of good mercantile seamen, and of the large number of foreigners employed, mostly inferior men; he gives the number of able seamen in both the naval and mercantile services as 40,000, and very rightly insists that we ought to have at least 100,000. His plan of obtaining able men in great numbers is admirable, and appears simple enough if enforced by law. It is that all ships should carry from one to four apprentices, according to their tonnage, lads serving as such for four years. This (according to his calculations) would provide about 30,000 of the rising young seamen, and in a few years amply supply all wants. Mr. Lindsay thinks that by remunerating shipowners, who may thus be forced to employ more apprentices than they require, the system would be popular as well as beneficial. Entering boys and ordinary seamen, and so filling the ships with half-and-half men, not only induces apprentices to break their engagement and desert, but is a practice which Mr. Lindsay condemns as a terrible evil; he says, "I conscientiously believe that far more vessels are lost, and that far more lives are sacrificed through incompetent and untrained seamen, than through unseaworthy ships."

We should probably find all difficulties vanish if, under the control of a Council and Minister of State for Maritime Affairs, the training of merchant seamen were treated as a national question. It affects alike the safety of our merchant shipping, the preservation of the lives of our seafaring population, and the formation of reserves for our standing Navy.

The Royal Commission of 1859, on "Manning the Navy," arranged for 20,000 Royal Naval Reserve and about 20,000 men of other forces as reinforcements; of these we have at present about 18,000 Royal Naval Reserve and 1,000 Naval Coast Volunteers; the remainder are not forthcoming. The Royal Naval Reserve men are in two classes,

<sup>1</sup> "Nautical Magazine," August—December, 1876.

but the second class should certainly be abolished as soon as we can get sufficient first-class men to complete the number; and then as the second line of reserve we should find 20,000 of the best seamen the merchant navy can produce, sufficient to recruit all our extreme wants at sea, and about 1,500 gunners, Royal Naval Artillery Volunteers, would be a valuable addition to our Coast Defence Force.

The present system of training reserve men answers admirably, and could not be improved upon; for there is great difference in the training necessary for such men and that required for those who man our ships in peace time. In the regular Navy we must have absolute obedience and strict discipline, continual drills and evolutions which appear unnecessary and tedious to those who do not grasp the importance of being always ready for any emergency. Nevertheless this importance must not be lost sight of; our ships are, and must always be, prepared and ready for battle, or any other service, at perhaps only an hour's notice. The difficulty, then, is to keep our men up to this extreme pitch of readiness, and still to preserve order, contentment, and cheerfulness in our fleets. On the other hand, the Royal Naval Reserve would only be employed in time of war, when men's minds would be fully occupied, and every exertion, both mental and bodily, would be called into action. If we can ensure obtaining a fine body of respectable men in those times, we need not look for perfection in drills, but may be sure that before being called upon to fight their ship, they will have made themselves masters of all that is actually necessary, as a gun-number, and putting manual power, intelligence, and bravery into their work, will prove of value almost equivalent to that of our regular highly-trained men-of-war's men.

As a last reserve we have in the country a large number of men who have served in the Royal Navy; and without the necessity of retaining our hold on them by a pension, the services of many of them could be obtained if England were really in danger by the offer of a bounty and re-entry with original ratings and good pay for such periods as might be required. A short service pension would be only an inducement to ten years' men to quit the Navy.

Before concluding this part of our subject, we will enumerate its salient points, and then consider the distribution of our seamen, &c.

The first question of importance in the organization of a powerful and economic Imperial Naval Force, is the satisfactory entry and training of our Officers, and the selection and advancement of those best fitted for the duties of the higher ranks; more has been said on the subject of the executive and engineer Officers than on other branches of the profession.

The entry of naval cadets at a later age, the training of junior executives, the institution of a central factory under Government for the manufacture of engines for the Royal Navy, and for supplying a school of training and instruction for our engineers, are the points most dwelt upon. Next, as regards the entry, training, and employment of seamen, barracks have been strongly recommended, principally with a view to establishing these matters on a more satisfactory footing. Simplification of all gun and small arm drills is insisted



upon, more general instruction being given and all specialities avoided. The aim should be to perfect our men as *seamen*, gunners, rifle, and cutlass men; the former standing first in importance, since seamanship exercises all that makes a man able and handy for any sort of work, especially the fighting and management of guns.

The Royal Marine Light Infantry is considered a most valuable force, and looked upon as the first reinforcement for the Navy in time of need. The Royal Marine Artillery are spoken of as being admirably adapted for torpedo duties, and the change in the name and employment of this corps is strongly advocated.

The Royal Naval Reserve is spoken of as capable of improvement under new laws for the obtaining and training of able seamen in the mercantile marine, and it is considered that 20,000 first-class reserve men would be ample for all requirements.

*On the Distribution of Officers and Ships' Companies in time of Peace and War.*—The principal difficulty here is the disposal of seamen proper, so as to admit of their being efficiently trained. Where great numbers are required this is almost an impossibility, unless large squadrons of instruction are continually and systematically employed; but excluding the able seamen we have only about 8,000 men in need of such training; and nearly all these can be employed, if we arrange that the proportion of seamen on board each ship be larger in time of peace and reduced in time of war, the vacancies being filled by marines and reserve men. (See Tables VI and VII.)

Table V gives the probable peace and war strength of our fleets.

TABLE V.—*Proposed Peace and War Strength of our Fleet.*

Description of vessels composing the fleets.		Average complement of men.	Number of ships	
			In time of peace.	In time of war.
Sea-going iron-clads.....	1st class .....	600	4	15
	2nd class .....	450	8	25
	Frigates.....	500	8	10
	Corvettes.....	300	9	12
Cruizers .....	Ditto .....	200	12	15
	Sloops .....	150	12	20
	Ditto.....	100	40	40
	Gunboats.....	50	22	30
Coast defence vessels.....	Ironclads.....	400*	10*	10
	Ditto.....	200*	20*	20
	Gunboats.....	30	10	50
Sea-going training ships.....		400	6	0
Troop-ships.....		200	10	20
Mercantile armed cruizers.....		200	0	50

\* Coast defence vessels that have half complements in time of peace.

TABLE VI.—*Distribution of the different Classes of Officers and Men composing the Crews of Her Majesty's Ships in times of Peace and War, showing the percentage of each Class on board Vessels to be employed on different Services.*

Classes of Officers and men.	Peace establishment.					War establishment.				
	Iron-clads.	Cruisers.	Home and colonial coast defence ships.	Troop-ships.	Sea-going training ships.	Iron-clads.	Cruisers.	Home and colonial coast defence ships.	Troop-ships.	Merchantable armed cruisers.
Officers Royal Navy (all branches) ...	9	9	10	10	8	8	8	6	5	2
Officers, R.N.R. and R.N.A.V. ....	..	..	..	..	..	..	..	2	5	6
Petty Officers and A.B's., Royal Navy	22	28	30	35	20	17	27	..	..	..
Other seamen and boys, R.N. ....	25	30	..	..	50	9	23	18	..	..
Petty Officers and seamen, C.G. ....	..	..	..	..	..	..	..	..	..	..
Seamen, Royal Naval Reserve, and gunners, R.N.A.V. ....	..	..	..	..	..	15	5	10	30	60
Stokers, Royal Navy. ....	10	5	30	25	..	12	6	10	10	20
Stokers from merchant service ....	..	..	..	..	..	..	..	10	15	..
Artificers and tradesmen, R.N. ....	8	7	10	5	6	8	8	6	5	3
Ditto, merchant service ....	..	..	..	..	..	..	..	4	..	..
Domestics, band, &c. ....	7	7	10	15	6	7	7	10	15	7
Royal Marine Light Infantry ....	15	12	6	10	10	20	14	20	15	..
Royal Marine Engineers (Torpedo Service) ....	4	2	4	..	..	4	2	4	..	2





From these tables we gather that about 15,000 seamen can be employed in both times of peace and war; only that in time of war all the petty officers and able seamen would be sent from troop and coast defence ships to man sea-going men-of-war, and their places would be filled by Coast Guard and reserve seamen.

A proportion of reserve seamen, and an additional number of marines and stokers, would be sent to all ships as soon as possible, thus admitting of the same number of seamen being further divided. In this manner the fleets will be placed on their war footing, and we trust would be found as equal to the duties they would have to perform as our grand fleets of old.

The mention of economy as one of the elements to be secured in our Imperial Naval Force may be very shortly dealt with. It is a truism that first-rate articles are cheapest in the end; let us procure at whatever expense of training the best Officers and men; and if we do not exceed the number required, we shall have acted on the most economic principles. The Turkish Government may congratulate themselves that by the expenses they recently incurred in their iron-clad fleet they have held the Black Sea up to the present time, and this has probably been the turning-point of their war with Russia.<sup>1</sup>

Had Russia been in her former position, and (as at Navarino and Sinope) at the commencement of present hostilities had destroyed the Turkish power at *sea*, she might, after crossing the Danube, have pushed her armies along the coast, receiving all supplies from Sevastopol and Odessa by water, and so have reached Constantinople ere this. Regularity of transport is the *chief* care in moving invading armies, and the sea is the best of all roads.

The value of a naval force is here demonstrated to the fullest extent, for though apparently passive, the mere existence of the Turkish fleet has, without doubt, most materially influenced the tide of war: let this fact weigh with English politicians, as illustrating comparatively the marvellous power of England as a great maritime nation, when her fleets are of sufficient strength to hold all waters against any enemy—

“Arma pacis fulcra.”

<sup>1</sup> This Essay was written during 1877.—ED.



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### Ebening Meeting.

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Monday, March 4th, 1878.

ADMIRAL SIR FREDERICK W. E. NICOLSON, Bart., C.B., Vice-President, in the Chair.

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#### IMPROVEMENTS IN LIGHTS FOR SIGNALLING AND OTHER NAVAL AND MILITARY PURPOSES.

By A. M. SILBER, Esq.

MR. President, by the kind permission of the Council, I am enabled to place before this important Institution a description of certain improvements in burners and accessory apparatus for the production of artificial light, with especial reference to the use of such light for various naval and military purposes, as for signalling, and for the side, the masthead, and the interior lights of ships. Before I proceed to these particular applications, it will be necessary for me to ask your attention, by way of introduction, to some brief observations of a more general character.

Seven or eight years ago, when I commenced my inquiries into the merits and demerits of the then accepted methods of obtaining artificial light, from vegetable or animal oils for domestic purposes, my first discovery was that these methods had remained substantially the same, and without improvement, for a century. I have read that the first lamp on record was formed by drawing a skein of some material through the body of an oily fish-eating bird, and by then lighting this skein either at the beak or at the caudal extremity. A step in advance of this was the lamp with which we are familiar as one of the ordinary articles found in ancient tombs an oval vase or oil-container, flattened on the top, furnished with a handle at one end and with an opening for the emergence of the wick at the other, and with an opening on the upper surface, through which oil could be supplied to the interior. Almost precisely like this in principle, and not very widely different from it in detail, is the common metal lamp in which the opening at the top is closed by a screw plug which carries a small tube for the passage of the wick; and this lamp, when required for out-door use, is inclosed within a case with



sides of glass or transparent horn, and then is called a lantern. Our ancestors of a hundred years ago had for a long time remained stationary at this point; but then came a great improvement, effected by Amy Argand, who replaced the rope of loosely twisted cotton, which had hitherto served as a wick, by a cylinder of woven cotton, which was surrounded by a chimney, and which permitted the free access of air to the interior as well as to the exterior of the frame. By this invention Argand obtained a brighter light than had been seen before; and his burner was very generally adopted for indoor lamps of the more expensive kinds, or for certain special purposes. I am unable to say how Argand was led to the discovery which has made his name a household word; but I suspect that it was more by accident than by research. If it had been by research, I think he could hardly have failed to carry the principle farther than he did, for he left his burner subject to the curious disability that its size could not be increased beyond a diameter of seven-sixths of an inch without total loss of all the advantages of the construction. It is not improbable that if this great physicist had made further experiments with his burner, he would have discovered that the upper part of the flame which it gives is insufficiently supplied with air, that is to say, with oxygen; and that for this reason a moderator lamp, fitted with the best form of the original Argand burner, as in the one now before you, gives only the light of one candle for each 65 or 66 grains of oil that it consumes per hour. As a contrast to this an Argand burner, when fitted with my central tube and obtaining from it a proportionate air current, consumes only 49 grains of oil per hour in order to afford the same amount of light. After Argand's time research certainly slumbered, and the only improvements made in lamps for burning animal and vegetable oil for domestic purposes were in trifling matters of mechanical construction, which had no intelligent relation to the quality or the nature of the combustion. Contrivances were introduced for forcing up the oil to the wick, or for keeping it at the same level as it diminished in quantity, as in the moderator or clockwork movements, or for placing the oil-container so that it cast no shadow upon a table, or for replacing a long wick which required winding up as it was consumed by a short one, which was changed whenever the lamp was trimmed. The shapes of the chimneys were also altered in various ways so as to influence the manner in which the air gained access to the flame, and in some lamps a cone of glass or metal was placed above the wick. With these exceptions nothing was done, so that from the dawn of history until the latter part of the eighteenth century, our ancestors were satisfied with a lamp which was practically a liquid candle, consisting of a loosely twisted rope of wick surrounded by fluid fat which it raised by capillary attraction; and from the latter part of the eighteenth century until now, as far as regards the burning of vegetable oil for domestic purposes, there was only one advance upon this liquid candle in the shape of the small circular burner, which received the name of its inventor, Argand. Apart from domestic uses there have been some improvements, and the elder brethren and the engineers of the Trinity House have generally

availed themselves of these, whether they were made in England or abroad, for the sake of improving the illumination of lighthouses, an endeavour in which they have very fairly succeeded. I also think it right to pay a tribute to the Board of Trade for the part taken by the department and its officers in working towards the attainment of efficient lights for ships.

It would carry me far beyond the limits of my available time to-night if I were to attempt to place before you, in any minuteness of detail, the nature of the changes which collectively constitute combustion; but I must crave your indulgence for a few moments while I speak of the broad principles. I am well aware that these principles must be familiar to my audience, but for the sake of completeness I can hardly avoid some brief reference to them. Combustion, then, depends upon a chemical union between the oxygen of the atmosphere and the hydrogen and carbon which are contained in the several substances used as fuel, such as solid fat, animal, vegetable, or mineral oil, or gas. The combustible solids and liquids, however, are not combustible while they remain in their solid or liquid forms, but only when first brought into the state of gas; and the function of the wick in a lamp or candle is to elevate the fluid fat to the flame by capillary attraction in such quantity that it may be volatilised by the heat, and thus brought into a state for combustion. Gas, as opposed to the fats, does not require a wick only because it is already in a state to be consumed, and can be delivered into the flame in sufficient quantity by the agency of pressure alone. Assuming the fuel to be a pure hydro-carbon, the products of complete combustion would be carbonic acid and water only; but if the fuel is impure the impurities may form other compounds of various kinds, some of which, especially some of the gas-products, may be highly destructive to many organic substances, and even to the health of the human body. Besides the incompleteness of combustion which may be due to the presence of such impurities, there is another form also which is of very general occurrence, and which depends upon a departure from the correct proportion in which the atmospheric air and the fuel should respectively be present in the flame in order to unite. It is manifest, or at least it becomes manifest when stated, that if the fuel should be present in excess, the combustion cannot be perfect. If the fuel be in a gaseous form, either at ordinary temperatures or in consequence of exposure to the heat of the flame, any excess which may be present may escape unburnt, and may be diffused abroad in the surrounding atmosphere, while, if the fuel be in a liquid form, the excess will either drown the flame and extinguish it, or, if not in sufficient quantity for this, will undergo only partial combustion or decomposition, forming products which may either be volatile and thus capable of diffusion, or which may remain and clog the fibres of the wick in such a manner as to impair its conducting power. We see all these results constantly produced in common flames. We have gas escaping only partially burnt or in various sulphur compounds, all being injurious to those who breathe them, and some being destructive to books, pictures, and furniture. We have petroleum escaping unburnt and

producing its characteristic odour in the room, and we have all ordinary lamp-flames flagging after a short time from the exhaustion of the conducting powers of the wick. The whole matter may almost be summed up by saying that, if we have too much fuel for the air-supply the oxidation and combustion of that fuel are necessarily incomplete, and if we have too free an air-supply for the fuel the temperature of the flame will be reduced by the air-current, and the combustion will be rendered imperfect in that way.

Prior to the commencement of my own experiments, the regulation of the fuel supply had been the only matter which had engaged attention. There is an apparent exception in the case of Argand, who brought his air-supply to the inside as well as to the outside of a flame; but the exception is apparent only. An Argand burner, properly explained, is nothing more than a slit, or a line of openings, bent round into the form of a ring; and the chimney, although it serves to quicken the air-supply, to steady it, and to send it in two definite directions, has little or no designed influence upon its quantity.

When a naked flame is burning in the open air, it is liable to be so suddenly cooled by currents that the temperature necessary for combustion cannot be maintained, and the flame is said to be "blown out." When it is burning in an inclosed space, as in an ordinary room, it is subject to the action of air-currents in a less, but still in a marked degree; insomuch that its variations of position and direction furnish the most delicate tests by which the presence and the course of currents can be determined. The air which feeds the flame finds entrance into the room by various channels, designed or accidental, and it enters with a certain velocity, which, when resisted by the presence of any substance against which it strikes, becomes converted into pressure, which, in its turn, may again initiate movement. When, however, the air which enters a room through a small aperture or apertures is colder, and consequently of greater specific gravity, than that which the room already contains, the former, by expansion, loses both its velocity and its power of exerting pressure; and it then becomes mingled with the air around it by a process of gradual and insensible mixture, according to the law of the diffusion of gases. We have, therefore, three conditions of in-coming air: the rush of a moving current, the pressure of an arrested current, and the imperceptible and gentle mingling with its surroundings of the current, the force of which has been consumed in the production of expansion. In an ordinary room, well warmed, the entering air is usually cold enough to be distinctly more dense than that which the room contains, and it rushes in through various chinks furnished by imperfectly fitting doors and sashes. The velocity of the entering currents is gradually arrested by the resistance of the comparatively stationary air which they meet, and some of their force is expended in producing their expansion; so that, before they reach a point very remote from that of their entrance, they are brought to rest, and become subject to the law of diffusion. When the air around a flame is moderately still, the flame feeds itself by its heating action, which causes the ascent of the air above and around it, and an equable lateral flow from all sides to take the place of that which is thus re-



moved. Under ordinary circumstances, this equable flow is only sufficient to support a somewhat sluggish rate of combustion; and the effect of the chimney of an Argand burner is to accelerate the upward movement by restraining it laterally, and thus to accelerate also the lateral flow by which the flame is supplied with oxygen. If a violent commotion is produced by opening a door or window, or if a flame be placed exactly in the track of an entering current before the force of this is exhausted, in either case the flame will be fluttered and disturbed; the rush of air past it being too great for its requirements, and sufficient to lower its temperature injuriously. Such conditions, however, are only of momentary or occasional occurrence; and, in all ordinary circumstances, the atmosphere of a room is so quiet that its few perturbations may be disregarded, and the burners for the production of light may be satisfactorily constructed upon the hypothesis that the air around them will be in a state of equilibrium, with a supply just sufficient to balance the consumption. To make a perfect burner for these conditions, it is only necessary to provide for the measurement, by a definite inlet, of the quantity of air which is admitted to the flame, as well as of the quantity of fuel, and to provide also for the distribution of this air in the manner and direction which are most desirable. It was formerly believed by gas engineers that a better flame was produced in Argand burners by what is called "throttling" the gas; that is, by compelling it to pass through very fine openings or channels before it was delivered into the burner, with a view to take off the effects of the pressure from behind, but it has recently been shown that this belief has no foundation. I have here a burner fitted to an ordinary half-inch pipe; and you will observe that its action is in no way different from that of one which is throttled in the ordinary manner. The simplest form of burner for perfect combustion is shown in my tubulated gas-burner, in which the supply of gas is regulated by a common tap, and the air-supply, partly by this square opening and partly by variations in the height of the chimney, according to the amount of light which it is desired to obtain, and so that the air and the fuel bear a constant and definite relation to one another. In order to provide for the proper distribution of the air, this pipe is inserted within the burner, in the centre of the flame; and it gives the in-coming air a definite direction towards the place where it is required. In the common Argand burner, as soon as a certain diameter is exceeded, the flame wavers and becomes feeble, because the mid-channel is then so large that the entering air may pass upwards clear of the flame, and without feeding it; but the internal tube, or, in large burners, a series of concentric tubes, causes the air to feed the flame, however large may be the circle of the burner, and has enabled me to make burners with a single wick, for the consumption of vegetable or mineral oil in lamps for domestic purposes, of any diameter that may be desired, as shown in the specimens now before you. You will observe, moreover, that the air, before it reaches the flame, passes through so much metal work that it becomes heated, and hence does not lower the temperature of the flame in any material degree. Finally, the chimney, by which the

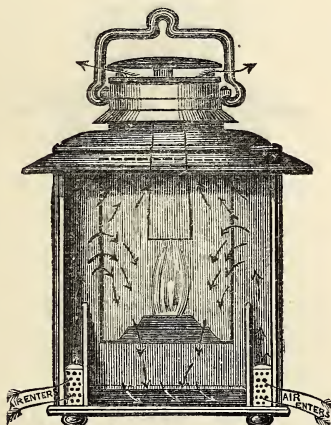
flame is inclosed, serves as a shield against the pressure of transient air-currents, and maintains a sufficient degree of steadiness for all ordinary purposes. A burner thus constructed, placed in an ordinary sitting-room, is liable to occasional and momentary perturbations, from sudden draughts, the opening and shutting of doors, and so forth, but its usual state is one of great quietude, during which the gas supplied to it is perfectly consumed. The practical result is, that for the same consumption of gas it gives more light than the best Argand which previously existed; and also that, because it consumes all, or nearly all, of the gas supplied to it in light giving, it leaves little or none to go free, either unconsumed or partially consumed, in the form of noxious compounds. Another result of the perfect combustion is, that the light more closely resembles sunlight in its quality than does any other which has been produced. I am informed by Professor Barff that its prismatic spectrum is nearly identical with that of the solar ray; and it certainly allows nearly all shades of colour to be distinguished as if in the day-time.

In gas-burning, where the fuel is already in a state fit for combustion, the problem of affording the best attainable light-giving flame is presented to us under its simplest form; and the application of the same principle to the consumption of oil has required certain modifications of detail. The chief object of these has been to prevent the premature destruction of the wick: and this has been accomplished by keeping the level of the oil below the flame, so that the upper part of the wick shall never be drowned in fluid; and next, by making the wick stand free, and clear of contact, between two metal cylinders, so that it shall not be scorched by the hot metal itself. By attention to these points the burner now before you was obtained. It may be used, with slight alteration, for either vegetable, animal, or mineral oil, and its advantages over most others are perhaps so manifest that they scarcely require to be pointed out.

Having thus arrived at the best possible combustion for domestic purposes, the next subject for inquiry was how the same principles could be applied to oil lamps which were required to bear exposure to weather. Such lamps are necessarily inclosed in lanterns, and a lantern is practically the same thing as a small room. It is, however, so small, that the currents of air which enter it have neither time nor space to lose velocity and pressure by expansion, but must strike upon the flame in a forcible manner, disturbing it by all their variations. Such lamps, moreover, are chiefly required for purposes for which the cost, the stowage, and the frequent breakage of chimneys are sources of great inconvenience; and it was therefore very desirable that chimneys should be dispensed with. The problem before me was how to construct a lamp-case or lantern, which should supply the contained oil-burner with precisely the amount of air required for complete combustion, which should render a chimney unnecessary, which should allow the freest exit to hot air and to the products of combustion, but which should be absolutely weather-proof, impervious to water either in the shape of rain or of waves, and so far impervious to wind-waves that their impact should neither diminish nor increase the

speed or the quantity of the air-supply of the flame. It was not sufficient to have entire defence against lateral wind-waves, but defence was also necessary against atmospheric pressure from above or from below, so that the flame might not be affected by hauling up the lantern to the mast-head, or by lowering it from thence, or by downward pressure from waves breaking over the side-lights. I have now the pleasure of placing before you ship's lanterns, intended to be used for mast-head and for port and starboard lights, in which all these requirements are fulfilled. The lamps burn colza oil, and with modifications of construction, would burn petroleum if required. They have no chimneys, and they give the light you see, which, photometrically tested, is equal to that of about fifteen standard candles, and, when reinforced by a reflector and concentrated by a cut dioptric lens, is equal to that of fifty standard candles, and can be seen, on a

FIG. 1.



clear night, at a distance exceeding five miles. They burn eighteen consecutive hours with no important diminution of light, requiring only, if the full size of the flame is to be maintained, that the wicks should be turned up a little every six hours, this being done by the milled head on the outside, without opening the door or disturbing the flame. They can be filled and trimmed with great facility by the use of one hand only, leaving the other free for holding on; and, as a new wick is dropped in at each trimming, there is no liability to derangement of the flame from irregular cutting of the old one. My assistant will now take a sheet of metal, and afterwards a large pair of bellows, and will show you that no amount of external wind will cause the flame to be affected to any material extent.

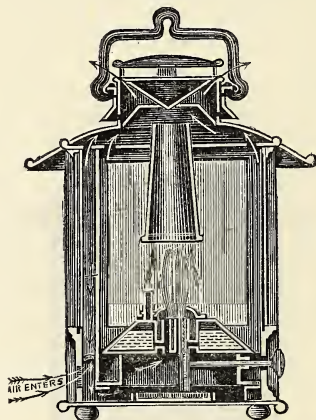
I have next to call your attention to the construction of the lanterns, and I shall explain this most easily by the aid of the large drawings which are here suspended (see figures), and by that of a



special lamp made for the purpose, in which some of the metal parts have been replaced by glass in order to facilitate inspection.

In these drawings, as you will observe, and in the lamp itself which stands before me (Fig. 1), the bottom of the lantern or case consists of a solid plate of metal, which is therefore impervious to air or water; and I may add that the whole of the workmanship is of such a kind as to exclude both air and water at every point where they are not intended to enter. At the back of the lantern there is an air-chamber contained within two vertical plates, here of glass, although generally of metal; and this chamber receives the external air through two vertical tubes, which are each half an inch or more in diameter, and rise to about one-third the height of the chamber itself, into which

FIG. 2.



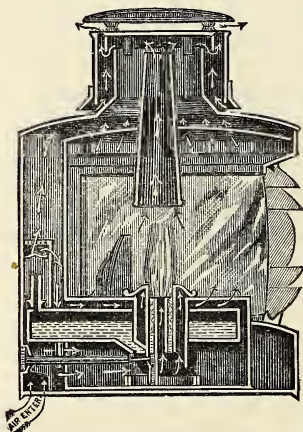
they open freely by their upper extremities. At their lower openings the tubes are covered by wire gauze, which divides the entering current and diminishes its force. At the bottom of the air-chamber, in front, is a horizontal opening or slit, about half an inch wide, for the further course of the air; and this opening leads to a space beneath the lamp, which communicates directly with the under side of the burner, to which, therefore, the entering air is directed (see Fig. 2). If we regard for the present only the question of air-supply, although bearing in mind that there is an outlet above which will require description presently, we shall see that, when the lamp is lighted, what happens is this: the products of combustion and a portion of the air within the circle of the burner, being heated and rarefied, ascend, and make way for more to come in and to occupy the space which would otherwise be left a vacuum. This more is contained in the space beneath the lamp, and is fed in its turn by the contents of the vertical chamber. But the air which enters this chamber through the vertical tubes preserves its vertical direction unchanged until much or all of its velocity has been lost by reason

of its expansion. Then, as it still retains greater weight than the warmer air already in the chamber, it next slowly descends; and, by the time it reaches the lowest level of the chamber, where only it can pass away, it has become subject to the law of the diffusion of gases, and moves onward to feed the flame, as it is required, and in no greater quantity than the consumption or removal of the air in front of it will make way for. In order to show the currents, I will light a piece of paper, and will feed the lantern with this smoke-carrying air, which will render the currents visible. You will observe how they pass upwards with considerable velocity, how soon this velocity is exhausted, how they then curl over and slowly fall, mingling in their descent, until at length they reach the bottom of the air-chamber in a quiescent condition. The principle is, you will observe, that the opening which leads onward out of the air-chamber is of such capacity as to convey no more air than is required for proper combustion; and that the air-chamber itself is a contrivance in which entering velocity and pressure are consumed or wasted, so that there is nothing left of them to exert any influence upon the light. However much the air external to the lantern may be agitated or disturbed, the effect of this agitation is absorbed and lost before the air reaches the channels which lead directly to the flame.

I pass on now to the consideration of the mode of exit of the products of combustion, and to the precautions which prevent the exit openings from becoming inlets either for water or for air. It is manifest that such precautions are required in practice to be very complete; and also that they have to meet different conditions under different circumstances; some lanterns being only exposed to the impact of currents of air which are horizontal or nearly so, that is to say, to wind striking them either horizontally or with a slight degree of obliquity, while others are exposed also to direct downward pressure, as when a mast-head light is hauled up quickly to its place, or when a wave breaks over a port or a starboard light. In the last-named case, when a wave curls over the top of a port or starboard light before falling upon it, the water compresses the air in its descent, and drives down beneath it a cushion of compressed air against the top of the lantern, while the pressure of this compressed air may be instantly followed by the powerful impact of a heavy mass of water. In order to meet these different conditions, I have two different tops, one calculated to resist the velocity of lateral currents, the other calculated to resist vertical pressure also; and in the side lanterns there is an additional provision against the ingress of water. The specimen lamp before me has only the top for velocity, the lantern being one of a class which is intended to be hung up overhead, in engine-rooms, passages, or other draughty places, but which is neither to be fixed to a ship's side nor hauled quickly to a height. I may point out in passing, that the weight and dimensions of the oil-container are such that it can be taken out and replaced with one hand, a feature in which it differs for the better from many of the engine-room and other overhead lamps now in use in the Navy. By reference to the diagram, or by looking at the lantern itself, you will see that there is above the flame an

inverted metal funnel, which serves to collect and guide the ascending currents produced by the heat of the combustion. These currents are thus conducted nearly to the top of the lantern, where they impinge, immediately above the opening of the funnel, upon the apex of an inverted cone, which is contained within this cylinder, and which allows them to pass upwards easily in all directions, and to escape all around it. Above the cone, supported on these three stems, is a horizontal plate, somewhat convex above, and of greater diameter than the cylinder which it covers, so that its projecting eaves prevent any rain or other small amount of descending water from finding its way into the interior of the lantern. The stems which support the covering plate are of such a height as to leave a free passage for air between the plate itself and the base of the cone below it; and hence, in whatever direction a lateral current may strike against the top, it

FIG. 3.

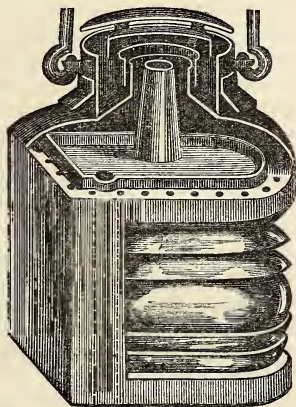


passes between the base of the cone and the covering plate, and out on the other side, with less resistance than it would meet in passing downwards by the sides of the cone. The result is, that wind does not pass downwards, but sweeps right through, with no other effect than to carry the heated air and the products of combustion rapidly before it, and thus to increase the brilliancy of the flame. This top is an old contrivance of mine, originally designed for street lamps; and we find that the street lamps which are fitted with it burn with a less brilliant light when the air is perfectly still, so that there is no horizontal current to clear away the products of combustion. A slight lateral movement of the air places them upon their best behaviour, and a gale of wind cannot affect them injuriously. Many thousands of these tops have now been in constant use for more than seven years, not only upon street lamps and signal lanterns, but also upon railway carriage roof lamps; and it is found in the latter that the flame shows little or no disturbance at the highest speeds of express trains, or even



when travelling through tunnels. The tops have also been used for the last five years in the work of laying and repairing submarine telegraph cables, by Messrs. Siemens Brothers, by Hooper's Telegraph Company, by Henley, and others; in this work the lanterns, burning mineral sperm oil, have constantly been affixed to buoys in very rough weather; and I have not heard of a single instance in which their light has failed. I convert the velocity top into a pressure top by the series of openings shown in this diagram (see Fig. 3), and which you will observe here in the mast-head lantern. Any air which may penetrate into the roof cylinder in a direction from above downwards, will find a more easy way through these openings than into the interior of the lantern, where its entrance would be resisted by the elastic column of hot air on its ascent. A small amount of water, if such were accidentally introduced, would also find exit harmlessly by the same openings.

FIG. 4.



In order to provide against a larger inflow of water, such as might possibly be forced into the top of a side lantern by the breaking of a wave, I have placed an outlet tube from this roof of the main chamber down through the body of the lantern (see Fig. 4), with a ridge of metal to direct any entering water towards it. The tube is of such a size as to afford an exit equal to, or greater than, any possible inflow; and the port and starboard lights, thus protected, may be exposed to the full force of any waves which sweep over them, without the slightest risk that they will be extinguished.

Returning now to the specially constructed lamp, you will observe that it is fitted with these wing reflectors, which are intended, when it is suspended in the engine-room, to cast light upon the places beneath which would otherwise be in the shadow of the bottom of the lantern. When desired, however, the same principle of air-supply may be adapted to a lamp in a glass case, like that of a railway roof lamp, by

which no downward shadow will be produced. Should time permit, will endeavour presently to explain how this may be accomplished.

Besides the overhead lamps of the pattern shown, I have here three smaller sizes, a larger one for passages, another smaller than the foregoing, for lighting up gauges, and a hand-lamp. The last is fitted with a bull's-eye in front and with two glass sides.

I have already mentioned that the larger or pattern lamp gives a light equal to that of fifteen standard candles as you see it before you; and that this becomes equal to that of more than fifty standard candles when aided by a reflector and by a lens of the best kind. It is desirable, of course, that the mast-head light, and the port and star-board lights, should be clearly seen at considerable distances; and for them, therefore, the reflector and the lens are necessary appendages. The lenses, if of the best kind, are very expensive, and they are liable to crack if heated and then suddenly cooled. During the use of the light they must, of course, be heated to a certain degree; and they are always liable to be suddenly cooled, and thus broken by rain or spray. For the mast-head and side lanterns, therefore, in order to preserve the lenses, I have sacrificed something of the steadiness of the light. I have done this by making perforations in such a way that in these lamps the whole of the air does not pass from the air-chamber to the space underneath the lamp, but a certain part is allowed to go through the openings shown in the drawing (Fig. 3), which conduct it over the oil-container to the outer side of the flame. The effect of this is that a constant current of comparatively cool air passes over the oil-container, and then upwards between the lens and the flame, and by this means both the oil and the lens are kept much cooler than would otherwise be possible. To keep the lens cool must always be important, and to keep the oil cool will be equally so if ever any of the mineral oils should replace those vegetable oils which are at present preferred. To this subject it will be necessary to return hereafter.

The lenses in common use for signal lanterns are of three kinds, the cut, the cast, and the blown, and the prices of these three varieties differ somewhat in the ratio of pounds, shillings, and pence. The object of the lens, of whichever kind, is to refract the rays of light in such a manner that they shall be spread out in a horizontal direction, and not diffused upwards or downwards. The result is, of course, that they are visible over a much larger angular aperture than if they were evenly diffused. The international maritime regulations require the mast-head lights of all sea-going ships to be visible over an arc of the horizon of twenty points of the compass; a requirement for the fulfilment of which a lens is practically indispensable, and it will be for the authorities to consider whether the cheaper varieties are sufficient for the purpose. The three varieties produce effects which are almost proportionate to their prices, and the reason is that the blown and the moulded lenses are composed of glass which is neither optically homogeneous nor truly curved, and that, by both these faults, much of the light which they receive is diffused irregularly or otherwise wasted. The cut lenses, on the contrary, may be relied upon for correct performance, and send in the desired direction the whole

of the illumination which the flame and the reflector supply to them.

Having satisfied myself that the lanterns which I have already placed before you were likely to fulfil the purposes for which they were designed, my next endeavour was to improve lanterns as a means of signalling by flashes. For this purpose I have added to a small mast-head lantern a simple mechanism for covering and uncovering the flame. This mechanism consists, as you may see, of a pair of curved metallic shutters, which are pivoted at the anterior extremities of the posterior third of the circle of the burner, and which either fall back, so as to reveal the light over the required number of points, or close up so as to conceal it entirely. The shutters are moved very rapidly by a rack and pinion to each, and the two racks are moved in their turn by a single button at the back of the top of the lantern, as now before you. To this button, when necessary, a cord may be attached by a bell-crank arrangement, so that, if the lantern is at the mast-head, the shutters may be opened and closed from the deck. I have also made smaller lanterns, intended to be used for hand-signalling, either at sea or on shore, in which the light is covered or exposed by the rising and falling of a single shutter, moved from the handle by a simple lever arrangement, acted upon by the thumb of the hand in which the lantern is held. In these the velocity or pressure tops can be removed and replaced by saucepans, in which food can be either cooked or warmed without any display of the light. This apparatus, either in the larger or in the more portable form, will be found well adapted for the requirements of the Morse code, which seems to be in some respects the best, as being popular, easy to learn, and lending itself readily to cipher correspondence. It has also the advantage of being in use in the Army, so that it would at present afford greater facilities than any other system for opening communications between ships and bodies of men on shore. I cannot help thinking that every able seaman should pass an examination in the Morse code before obtaining his certificate, by which plan it would soon be understood throughout the Navy. Still, it is not my business to pronounce upon the merits of different systems, neither am I wedded to any; and these lanterns will suffice equally for all. Either upon sea or upon land they afford a far-reaching light, they require little attention, they are weather-proof, and the light can be obscured or revealed in an instant by this simple arrangement, in which there is nothing liable to be broken or deranged in ordinary circumstances. The light can be kept entirely concealed except at the moments when signals are being sent, and the lantern will fulfil all the purposes of a cooking stove, and may thus render a bivouac fire unnecessary.

There is yet one other form of ship's lamp to which I would briefly call your attention; and that is, an engine-room lamp to hang overhead, but little modified from the old service pattern, and yet constructed upon my principles, after a plan originally devised for railway carriage roof lamps. It has the advantage of a perfectly transparent base, in which there is nothing to cast a shadow below; and it occupies less room than the lamp with wings, already before you, in which the



shadow is diminished or overcome by lateral reflection. The burner of this lamp is contained within a double glass basin, and is placed upon an opening in the inner basin; so that the space between the two fulfils the purpose of my air-chamber, and allows the force of the entering air to expend itself before it reaches the flame. Such lamps may be fitted with tops either for velocity alone or for pressure and velocity combined; and I have a second pattern also, something of the same external appearance, in which the glass bowl is single. The chief disadvantage of these is that they require glass chimneys; but, in order to reduce this disadvantage within the smallest limits, I have attached the glass chimneys to metal tubes, so provided with projecting collars that the glass portion is stopped from coming into contact with the other metal work of the lamp when it is being inserted, or when it is in its place; and is also stopped from coming into contact with the ground, or with a table, when it is withdrawn and laid down. By this arrangement, while a brilliant light is given, the chances of breakage are rendered extremely small.

The lamp thus constructed is a decidedly ornamental one; and would, at first sight, seem to be as suitable for a saloon as for an engine-room. This, however, is not quite the case; and for saloons I recommend lamps of the moderator pattern, which may be fitted with my burners, and which carry their oil in a receptacle below the flame. Oil, like other things, expands when heated; and this expansion is a common cause of overflow and leakage from lamps in which the oil container is above the flame. We often see this in railway roof lamps; and nothing is more unsightly than to have an overflow of oil into the glass basin, washing to-and-fro with every roll of the vessel.

Before I take leave of my lamps, I must mention another quality which they possess, and which all naval men, I believe, will admit to be an important one. The position of the oil-container, in reference to the flame, is such that the heating effect of the latter, although never excessive, is yet always sufficient to preserve the oil from congelation. Instances have not been wanting, as I am informed, in which lamps at the mast-head have been extinguished by the freezing of their oil.

I would also say a final word on the question of trimming these mast-head and side lights, which only require the wick to be turned up from outside every six hours. The light is in no way interfered with while this is being done; whereas, as I am told, collisions at sea have more than once been occasioned by the temporary withdrawal of a light for the purpose of trimming it, and during the few minutes which were occupied in the process, I therefore put forward the length of time during which my lamps will burn as a property which alone contributes to their value in a very appreciable degree. I mention this with the more satisfaction, because the result has been obtained by much thought and labour, and after some complete and many partial failures. In 1873, the Board of Trade presented to Parliament a report upon the performances of various lamps; and in this report it is said of mine, as they were then made: "This light is too com-

“ plicated, cumbersome, and expensive, ever to be an efficient ship’s light. The length of time it requires for trimming is very objectionable, being nearly double that of any of the other lanterns under trial. It also involves a greater amount of attention, requiring trimming and refilling every three hours, which is much against it as a ship’s light. After being first lit and properly trimmed, it gives a most brilliant light for about two hours, after which the light becomes exceedingly indifferent until the lamp is again trimmed. I should exclude this light as altogether unfit for use as ship’s lights.” The reports made since then have been of a very different character; and, what is of still more importance, after I had been permitted to place lamps experimentally on board some of the ships of the Channel Squadron, the Admiralty not only desired to keep them, but also to be supplied with more.

I think it will be fair, at this point, to invite your attention to a comparative statement of the light-giving power and the oil-consumption of the lamps now in use in the Navy, as contrasted with my own. The Table here suspended exhibits the results of an examination made by Mr. Valentin, at my request, of the performance of Navy lamps which have been borrowed from the Admiralty; it will be seen that, light for light, my lamps effect a saving of from 33 to 54 per cent. The largest lamp, burning the best colza oil, and with the aid of reflector and lens, gave the light of 8·70 candles, and consumed 50·60 grains of oil for each candle per hour. The square engine-room lamp gave the light of 5·35 candles, and consumed 94·8 grains of oil per candle per hour. The gauge lamp gave the light of 1·99 candles, and consumed 1·24 grains of oil per candle per hour. The performances of my own lamps are shown side by side with those of the others; and as a parallel set of facts, I have here, obtained from Professor Barff, who conducted the experiments, the results of a competitive trial of railway roof lamps, which was undertaken by the Society of Arts. The best chimneyless lamp burning colza oil, excepting my own, gave a light below that of four candles, and consumed 116 grains of oil per candle per hour; while mine gave a light of sixteen candles, and consumed only 68 grains of oil per candle per hour.

I have already mentioned that my lamps can be arranged to burn either vegetable or mineral oil, and these which you have as yet seen all burn colza. I entertain strong objections to the use of petroleum on board ship, and that for various reasons. In the first place, petroleum oil has a great tendency to soak into any woodwork on which it may be spilled, and to render it highly inflammable. A lamp-room on board ship, in which petroleum is used, is very liable to take fire; and I may remind you that this actually happened not long ago in a training-ship in the Thames.

In the next place, in foreign countries, from whence, in the common course of things, supplies must sometimes be obtained, there is not the security for the quality of the oil which is afforded by the Petroleum Act at home; and hence oil of a dangerously light and inflammable character would sometimes be taken on board.

Lastly, even with oil of the English standard, and still more, of course, with any lighter variety, there is always a risk lest it may be overheated in common lamps, and may overflow, being kindled in its way, and descending in liquid fire. Notwithstanding these grave objections, I have little doubt that the cheapness of petroleum will in time secure its introduction into the Merchant Service; and, if this should ever happen, its use should only be permitted where certain precautions are strictly enforced and where it is burned in the safest possible way. It has been suggested to me that, in order to avoid soakage, the walls of the lamp-room might be of metal, and its floor covered by a layer of concrete. Returning to my more immediate subject, I have here two ship's mast-head lamps which burn petroleum, one with a chimney, which gives, when photometrically tested without a reflector, a light equal to that of seventeen standard candles; and one without a chimney, which gives, when tested in the same manner, a light equal to that of seven standard candles. I would now direct your attention to the experiments made with petroleum lamps, with a view of ascertaining the temperature of the oil after several hours' burning, and which you will perceive is only slightly higher than that of the atmosphere where the lamps were tested. This result has been obtained by placing a simple air-jacket around the oil-container, so that air may circulate freely around the oil. The jacket and the oil-container are connected only by one brass tube, which also serves as a socket for the chimneyless burner. In the larger burner, the connection between the two chambers is still more slight; so that there is scarcely any conduction of heat to counteract the cooling effect of the air-current. The anchor-light, as already stated, gives the illumination of seventeen candles.

And now, Mr. President, it is time for me to bring my discourse to a conclusion. It will be for this distinguished audience, and for naval and military authorities generally, to say whether the work to which I have devoted several years, and much anxious thought, is of a value and importance commensurate with the pains which I have lavished upon it. The question is in reality whether the old methods of lighting and of signalling can be accepted as sufficient for the requirements of the present day, for the enormous increase in the number of the ships by which all seas are perpetually traversed, and for the enormous increase in the individual value of those ships, and in the average number of human beings which they contain. The lamps which I have placed before you are more expensive than the old ones; and if a few pieces of metal, put together anyhow, and containing oil and a wick, are sufficient for our present needs, and are in correspondence with the other appliances used in the Army and Navy, then my labour, and your time in listening to me so indulgently, have alike been thrown away. My own conviction, however, is very strong that the costly engines of our great ironclads, or of our great Atlantic liners and other merchant steamers, require to be closely and carefully examined in a way which only good lighting can render possible; and that the crews of such vessels should be able to communicate intelligence or, if need were, to summon help, from over a far wider range than their



present lights will reach. The expense, I may be permitted to point out, is one of first cost only, and depends merely upon originally obtaining a properly constructed machine as the source of light. Light for light, perfect combustion is cheaper than imperfect, and these appliances do not render it imperative that those who have them should produce more light than they require. They give, without reflectors, a range of from five to twenty-five candles, according to the circumstances which may render any given degree of illumination desirable.

I would say one final word in behalf of our sailors, who, especially in some of the ironclads, live below in perpetual semi-darkness. I have seen, in these vessels, twelve men sitting around a table which was lighted, or rather the darkness of which was rendered visible, by the flame of a single rushlight, placed at one end of the space devoted to them. It was, perhaps, possible for one man of the twelve, if his sight were very good, to read or otherwise employ himself; but the rest were condemned to compulsory idleness. I cannot believe that such a state of things can be good either for the service, of which all Englishmen are so proud, or for the individual seamen who are placed in such a position; and I never felt more acutely the need there is for improved lighting on board ship than when I saw, at Portsmouth, the arrangement which I have attempted to describe, and with which many of those who hear me must be perfectly familiar.

I have mentioned that the lamps which I supplied to Her Majesty's ships were at first only lent to them for trial, and that after they had been in use nearly two years, the company by which they were manufactured received an order to supply more for other vessels of the Fleet. I have thought it would be agreeable to you to see to-night lamps which are in general use in the Navy, and which were the best that could be procured up to a recent date, and so I have obtained the loan of these from the Admiralty. I take this opportunity of publicly thanking their Lordships for thus lending them, and also of acknowledging, in the very warmest terms, the constant help and the ready courtesy and kindness which it has been my good fortune to receive from all naval authorities and officers, from the highest to the lowest. It only remains that I should thank you also for the flattering attention which you have been pleased to bestow upon my address.

*Tabulated results of experiments made by W. Valentin, Esq., F.C.S., Principal Demonstrator of Practical Chemistry in the Royal College of Chemistry, London, for Mr. A. M. Silber's Lecture at the Royal United Service Institution, 4th March, 1878.*

*Engine-room and Passage Lamps.*

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power : (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
1. * Admiralty's Brass-back Lamp for engine-room (for lighting wing and screw-shaft passages) <i>with chimney</i> . Oil supply at back of burner.	18th February hours min. 3 53	507 grains	(1) 8·0 candles (2) 2·7       " Mean 5·35       "	94·8 grains	Burns very wastefully and irregularly.
2. Silber's Brass-back Lamp for same purposes as No. 1, <i>with chimney</i> . Oil supply at back of burner.	23rd February hours min. 2 57	834 grains	(1) 16·0 candles (2) 15·2       " Mean 15·6       "	53·5 grains	With reflector, 76 to 80 candles.
3. Silber's Engine-room Lamp, similar in shape to Nos. 1 and 2, but with handles. This lamp is <i>weatherproof</i> . Oil supply beneath the flame. <i>Without glass chimney</i> .	18th February hours min. 3 42	1,005 grains	(1) 16·08 candles (2) 13·0       " Mean 14·5       "	69·8 grains	Tested without reflector. Height of flame about 3 inches, 2 inches of which are full-bodied, shape good, colour white.

Saving—light for light—shown by Silber's lamps, about 35 per cent.

*Engine-room Lamps.*

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Con- sumption of Oil (Colza).	Illuminating power : (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
4. *Admiralty's Overhead Hanging Lamp in brass with clear bottom bowl; circular opening in centre of bottom, brass guard; oil container over burner and inside the lamp. <i>With</i> (shouldered) <i>chimney</i> .	23rd February hours min. 4 20	480 grains	(1) 6·0 candles (2) 4·75       " Mean 5·38       "	89·2 grains	
5. Silber's Overhead Hanging Lamp in brass with clear bottom bowl, <i>without opening</i> in bottom; oil container outside the lamp and above burner, which is inside lamp. <i>With chimney</i> .	23rd February hours min. 4 20	884 grains	(1) 13·2 candles (2) 13·2       " Mean 13·2       "	67 grains	Splendidly equal light. Glass shade cuts off one candle.
6. Silber's Overhead Hanging Lamp, similar in shape to No. 5, but having <i>two</i> clear bottom bowls, burning <i>without chimney</i> .	23rd February hours min. 2 25	859·86 grains	(1) 16·0 candles (2) 14·2       " Mean 15·1       "	56·95 grains	Flame short in height, but uniformly white.
7. Silber's Square Overhead Hanging Lamp, no glass bottom bowl; oil container below or under burner. One side opens as door, oil container easily removed by one hand; burns <i>without chimney</i> .	18th February hours min. 3 47	1,040 grains	(1) 20·7 candles (2) 18·0       " Mean 19·35       "	54 grains	Height of flame about 4 inches; shape good, colour white.
Can be used with or without silver reflectors.					

Saving—light for light—shown by Silber's lamps, 33½ per cent.



*Gauge Lamps.*

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Con- sumption of Oil (Colza).	Illuminating power : (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
8. Admiralty's Brass Lamp with 3 wicks. <i>Without chimney.</i>	23rd February. hours min. 4 25	248 grains	(1) 2·18 candles (2) 1·8   " Mean 1·99   "	124 grains	Smoked tremendously. <i>With reflector.</i> (1) 3·25 (2) 2·40   Mean 2·8
9. Silber's Brass Lamp, similar to No. 8, but <i>with chimney.</i> Oil container beneath the burner.	23rd February. hours min. 4 25	594 grains	(1) 9·4 candles (2) 8·4   " Mean 8·9   "	66·8 grains	<i>With reflector.</i> 31·5 to 37 candles.
10. Silber's Lamp, similar to No. 9, but <i>without chimney.</i>	23rd February. hours min. 4 25	646 grains	(1) 10·5 candles (2) 8·7   " Mean 9·6   "	67·3 grains	<i>With reflector.</i> 30 candles.

Saving—light for light—shown by Silber's lamps, 46 per cent.

*Mast-head, Bow, and Signal Lantern.*

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Con- sumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
11. *Admiralty Mast-head Lantern, with new reflectors and new glass lens.	9th February. hours min. 2 44	440·7 grains	<i>With Reflector and Lens.</i> (1) 12·4 candles (2) 5· ” — Mean 8·7	50·6 grains	This lamp had 6 single string wicks only.
	18th February. hours min. 3 42	414 grains	<i>Without Reflector, but with Lens.</i> (1) 10 candles (2) 7 ” — Mean 8·5	48·7 grains	With new reflector, this lamp gave only a slightly increased light, viz., 16 candles. The wicks were found in fair condition.
12. Silber's Mast-head Lantern (ready to be sent out) with re- flector and lens. Argand burner without chimney.	18th February. hours min. 3 0	1,005 grains	<i>With Reflector and Lens.</i> 50 candles <i>Without Reflector, but with Lens.</i> 40 candles.	20·10 grains  25·12 grains	

Saving—light for light—shown by Silber's lamps, 54·43 per cent.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Con- sumption of Oil (Colza).	Illuminating power : (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
13. Captain Colomb's Patent Signal Lamp (new Lamp, bright re- flector) made by Nunn.	9th February hours min. 3 35	279 grains	<i>With Reflector and Lens.</i> (1) 11·8 candles (2) 2·2    " — Mean 7       " <i>With Lens.</i> 30 candles	43 grains	The lamp had 7 single string wicks which burnt well at first, but after 4 hours burning were all but de- stroyed, 2 were quite ex- tinguished, the heads of 2 fused into one, and one was burning very low.
14. Silber's Mast-head Signal Lamp with French dioptric lens, Ar- gand burner, without chimney.	9th February hours min. 4 5	724 grains		24·13 grains	
15. Silber's Starboard Lantern.					
16. Silber's Port Lantern.					

Saving—light for light—shown by Silber's lamps, about 40 per cent.

NOTE.—Silber's Mast-head and Bow Lanterns are constructed to burn the same size wick (diameter  $1\frac{1}{8}$  in.) as in his Engine-room Lamp No. 3, and as the conditions of burning are almost the same, it may fairly be assumed that the light given by the former without lens, is the same as that of the latter, viz., 14·5 candles, and the consumption per candle-light 69·8 grains per hour.

*Silber's Moderator Lamps for Ship's use.*

	Diameter of Wick.	Candle-light.	Average Consumption per hour per candle power.
No. 1 burner .....	1 inch .....	25·9 candles ..	49·0 grains. 65 to 66 grains.
No. 2    " .....	$1\frac{5}{16}$ " .....	32·5       " ..	
No. 3    " .....	$1\frac{1}{2}$ " .....	42·5       " .. Ordinary moderator..	



*Petroleum Lamps.—Tested to Ascertain Temperature of Oil after ten hours burning.*

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Con- sumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
Petroleum ship's lights. Silber's Flatwick Mast-head light (with- out glass chimney).	..	..	<i>With Reflector</i> 43 candles <i>Without Reflector</i> 7 candles	..	Tested chiefly for <i>tempera- ture</i> of Petroleum in oil container. Temperature of atmosphere, 50° F. Temperature of Petroleum after burning in open air for some hours, 68° F.
Silber's Anchor Light (1877) burner with glass chimney.	..	not	tested	..	Temperature of Petroleum in oil container, 53° F.
Silber's Mast-head Lantern (1877) burner with glass chimney.	..	not	tested	..	Little oil left in oil container —Temperature 73·4 F. The oil container was quite cold.

(Signed) WM. VALENTIN,

Principal Demonstrator of Practical Chemistry in The Royal College of Chemistry.  
South Kensington Museum.*February 27th, 1878.*

Admiral Lord CLARENCE PAGET : I am not going to occupy your time this evening. You have more able and scientific men than myself present, who will probably give their views on this matter. All I can say is, I have for several years used these lights, and I have found every word the lecturer has stated, perfectly true, and that they are impervious to the sea-water breaking over them. Whenever in the length of the summer nights I have had occasion to use them, they have never wanted trimming, and certainly we have been distinguished from all other yachts in a large fleet. I remember only last summer being at Cowes with a fleet of upwards of a hundred yachts. Mine was a small yacht, and of course had a small light. They did not know where my yacht lay, but in the Club House I asked the members to look at the fleet and say which was the brightest light in the roads, and they one and all gave it altogether in favour of my yacht, which carried Mr. Silber's light.

Captain STEWART HARRISON, London Engineer Volunteers : I would ask permission to say a few words on this very important topic. Mr. Silber has provided us with a number of most excellent instruments, but I fail to see the players. The question of signalling at this moment, as he states, is one of the gravest importance in both services. The rapidity of motion in steam-vessels, and the almost certain death that attends mounted Officers in many positions, will render signalling in the Army and Navy a question of the very greatest importance if any of those things which we are now all thinking about, should happen. Hence, if I may for a few moments take this question out of the region of the lamp-maker and the mechanic, and take it to the region of the philosophy of signalling, I would venture to say, speaking as I am to men who have endeavoured as conscientiously to acquire the art of signalling as they have attempted to acquire a knowledge of their other duties, that they will confess that the acquisition of signalling by the Morse system is one of those things that have baffled them. I do not think that any man over forty could possibly acquire precision in working the Morse system of signals ; and that there is some radical defect in the present system of signalling will be manifest from what I am about to state, that in the whole of the Mercantile Marine there is no recognised communication between vessels at night. A vessel at anchor will see another coming bows onward that will crush her to pieces, and yet she has not a single means by which she can make known the fact that something prevents her getting out of the way. Granted there is a rule of the road ; granted there are a number of circumstances which may justify its continuance ; it is a most remarkable thing that in a country of practical men like Englishmen you have no recognised communication amongst the Mercantile Marine, whose interest it is to have this mode of communication, if it existed. I believe we took to the Morse system by a mistake, and we threw on mind what we ought to have thrown on mechanism. I think, with reference to the Morse system, that the extraordinary simplicity of the flash has deluded men into the belief that they could all learn it. I am speaking now in the presence of naval and military Officers, and I will ask any military Officer now present how many of the men whom they sat down to mess with to-night could be trusted by the Morse system to signal an order to the regiment to which they belonged ? I do not believe 5 per cent. of your Officers could be so trusted, and of your men I do not believe  $2\frac{1}{2}$  per cent. could be. If I go to the Navy, I believe we shall find that only 10 per cent. of the Officers are capable of conveying a message, and I certainly believe nothing like 10 per cent. of the men could do it. Under these circumstances it does become an absolute necessity for an Institution like this to make inquiry whether this system, which has been in existence so long, which has so conspicuously failed to penetrate where you would be most likely to expect it to penetrate—whether it has the merits that have been claimed for it. I am not at liberty, I believe, to-night to introduce a remedy for these things, but I will simply say this is what I am prepared to do. I will go on board any of Her Majesty's ships, and with the assistance of the carpenter and the lamp-maker and Mr. Silber—and Mr. Silber will be my most able assistant—I will in two days furnish you with a means of communication at five miles from one vessel to another, and in a week every man on board that ship who can read and write shall be competent to exchange signals with any vessels at that distance. I will go down to Aldershot, will take a class of Officers, and in one day those men shall be able at two miles to drill a battalion as easily as if they stood in

front. I make these statements, and I simply ask an opportunity of proving what I say before the members of this Institution.<sup>1</sup>

Major-General BABBAGE: I think we must all agree in praising the light exhibited by Mr. Silber, but in what I have to say I wish rather to follow the last speaker in the matter of signalling. My father, the late Charles Babbage, in the year 1851, publicly exhibited his occulting light.<sup>2</sup> It is so arranged that any seaman could count the number of the flashes, "one, two, three," &c., as Mr. Silber has shown us in one of his own lamps. It seems to me that this is a thing which is not beyond the intellect of the commonest seaman or soldier, and, as the last speaker has said, with Mr. Silber's aid I believe signalling may be made easy both in the Navy and in the Army.

Professor BARFF: I shall be very happy to make a few remarks on some experiments that Mr. Silber has alluded to which I have initiated from my own point of view, a point of view which will be of interest to those engaged in Army and Navy matters in cases where colours have the property of being clearly distinguished in signalling. Three years ago, in my lectures at the Royal Academy, I introduced Mr. Silber's light to the students, because I found it to be that which gave the purest white light of any artificial light I knew of. This was done, I will not say entirely without the knowledge of Mr. Silber, because I had put the light in my own room where I keep pictures, and had found it to be so successful that I asked him to lend me some lights to illustrate my experiments at the Royal Academy, and there I showed some papers before the students tinted with the palest possible yellow and green. Very delicate tints of yellows and green cannot be distinguished from whites and blues by the ordinary Argand burner, but as soon as Mr. Silber's light was used, the students were able at a distance of this lecture theatre to distinguish the colours one from the other. Only last week, in conjunction with Mr. Brudenell Carter, a scientific oculist of great eminence, I performed some experiments to judge of the character of the Silber method of burning oil, gas, and petroleum, he looking at it from the oculist's point of view, and I from the artist's point of view, although I am not an artist but a chemist. We found that in the case of the Silber light, we had nearly the proportions of the solar spectrum, or the electric spectrum, which answered our purpose perfectly well. With the ordinary Argand we had not those proportions, because the violet rays were utterly absent in the spectrum from the Argand, and only a very little of the indigo was seen, whereas by the Silber the petroleum and the gas being the only two we tried, we found we had both the indigo nearly perfect and violet rays as well. I wish to mention this, as it is a matter of considerable importance, for white light is the most wholesome for the eyes; it is the best where colours have to be dealt with, and has the greatest possible penetrating power in darkness. I will not detain you longer, but at some future time (and these experiments will take some time) I hope I shall be able to publish the results, and if an opportunity is given to me I shall be most happy to state those results before this Institution.

Mr. LANGLEY: I am not a naval nor yet a military man, but perhaps I may be able to say something about these lamps as used on railways.

I recommended the use of Mr. Silber's lamp to the Great Eastern Railway; they adopted my suggestion, and we have now over a thousand of those lamps in use, and have never had any instance of failure either through the lamps going out or the chimney blackening. The economy of the lamp is very great over the old rape oil lamp, and altogether it has proved very satisfactory. There is one point which is very important, that is, that the light always remains the same as when it is first lit, and it continues burning the same light for as many hours as required. The difficulty with lamps has always been to supply sufficient air, and still not blow the light out. A great number of experiments have been made in order to attain a satisfactory lamp, but they all failed until Mr. Silber's arrangement was introduced. In

<sup>1</sup> Captain Stewart Harrison would be glad to communicate with any owner of a yacht, or other person taking an interest in the question. He estimates the cost of a pair of signal screens, nine feet by three feet, sufficient for a yacht, and visible at from two to three miles, at about £6 10s. Any carpenter can make them, and the lights are simply the police bull's-eye lanterns. His address is with the Secretary.

<sup>2</sup> It is described in "The Exposition of 1851," by C. Babbage.



regard to the question of burning rape oil I may state that Mr. Silber's lamp burning petroleum with a proper lantern is as safe as the rape oil. Many lamps have been used where proper ventilation has not been given, and the result has been the petroleum has got so hot that there has been an explosion, or it has blackened the chimney, but with Mr. Silber's arrangement the oil in the cistern is kept 10 or 20 degrees cooler than the flashing point, and it has always been a perfect success.

Mr. Frederick PATTISON: I have had much pleasure in listening to what Mr. Silber has said, but there are one or two points on which I should like to ask him questions. Of course in the Navy, as well as in domestic and other lighting, economy is a great thing to be considered. Mr. Silber has given us no particulars, as far as I can make out, as to the consumption and cost of oil for light given. I should have liked to have heard something on that subject, because it is one that is very important. We have wandered somewhat from our subject to that of signalling, but may I ask in what respect the new flashing signal differs from that which has been in use in the Navy for many years? I admit that Mr. Silber has shown us a superior light, but still the old flashing signal, as far as I know, was quite capable of being brought to the same power as the one we have now dealt with. I should also like to know whether it is usual for mast-head lights to be used as signal lights. I think not. Then, as far as railway lights are concerned, in what respect does the light we have had described to us show an improvement upon many lights at present in use? With respect to the lighting Her Majesty's ships Mr. Silber spoke of a "dip" being used to give light to the mess tables. I would ask whether he has been lately on board Her Majesty's ironclads so as to be enabled to speak on that subject more fully than he has done, because, as far as my experience goes, the lighting of the ironclads at the present time is far superior to that described by the lecturer.

Captain COLOMB, R.N.: I think Mr. Silber is to be very warmly congratulated on taking the lamp question out of the area of those "pieces of tin and bits of glass" which he spoke of, and putting it on to some definite and scientific basis. I am quite certain that every movement which is made towards the improvement of light, whether it be for the time successful or not, is perfectly certain to leave its mark; and I think myself that next to heating there are very few questions more important than lighting. To plunge at once into some of the details, I am quite certain that the meeting will excuse me from attempting to follow the whole of them, for they have been piled upon our heads something like Pelion upon Ossa. It has been extremely difficult to follow the lecturer through the statement of his principles, and the methods by which he carries them into practice. But I notice one thing in the whole of his lamps, and this is distinctly a point that we should carry away with us, and, remember, every lamp he has produced is a rival to some bygone fellow, and is *larger*. Now, the moment you increase the size of a lamp, you approach more nearly to the ideal which the lecturer put before us. The moment you enclose your light in a larger framework, or lantern, you get rid at once of half your troubles; because, as the lecturer distinctly pointed out, the currents of air are dissipated before they reach the flame, and therefore do not disturb it. Now, I am sorry that when he prepared this paper, and brought the question before us, he did not recognise the necessity of confining himself to present sizes, because the size of lamps is an exceedingly important element in their use on board ship. Those bow and mast-head lights that you see are of course considerably larger than those others beside them. But while I say this—and I am bound to give an honest criticism—I do believe that the method of supplying air to the lamp is new, and so far as I can judge from the very hasty notion I have formed upon it, the idea is not like most of the new ideas, it is true. Mr. Silber seems to have done this. You have two difficulties to contend with in supplying air to lamps which are exposed to the weather, the force of pressure and the blow due to currents of air. Now by admitting the air into his air-chamber, and allowing the superfluous air to escape at the top of the lantern while only that which is actually required by the flame itself passes below, he seems to have guarded against both those dangers; he seems to have got rid of the pressure by opening the place for the air to escape at the top of the lamp, and to have got rid of the current by the old arrangement of what is called the brake—something for the air to throw itself against and radiate from. I would not put too much faith in Mr. Silber's trial by bellows; it is exceedingly deceptive. Many a

lantern which you may blow against with all the bellows ever constructed in a room, will not stand a very moderate breeze of wind. That is a practical result which I achieved after very many experiments. I found I was obliged to give up the bellows trial altogether, and I had always to wait for a gale of wind, and try my lanterns in that gale of wind. I found that was the only trial worth anything. I do not think that the reduction of oil consumption is of very great moment, at any rate to Her Majesty's ships. But we must never forget this, that Mr. Silber gains his increased light not altogether by gaining upon the consumption of oil, but he must, I think, in all cases, for a given size of wick, increase the consumption of oil; but then given that increase, he will get more light out of it than could be got by other processes. So that there is an economy really, if you propose to burn more oil; but if you are limited in the quantity of oil you burn, then of course there is not an economy, that is to say, you *must* burn more oil.

Now the difficulty in the whole question is the difficulty of complication. Mr. Silber, and many of us here, would be perfectly competent to manage any of these lights, but my difficulty has always been to fit the lights to the men who had to use them. I cannot alter the men; I have never been able to do so. I have tried over and over again to alter the men, but I find the one thing which will not alter is mankind; and whenever I have attempted to bring material to the use of mankind I have found that I have had to suit the material to the man, because I was unable to suit the man to the material. If I am wrong in supposing that the complication of these lamps is considerably greater than that at present attaching to lamps in use—in the Navy for instance—of course my argument falls to the ground. But that is a matter which can only be tested by practical experiment, and I wish Mr. Silber had been able to produce to us the reports of his lanterns as used by Her Majesty's Government. I know it is very difficult to get those reports. There is an objection in official quarters to furnish reports—a very mistaken one in my opinion—and it is very difficult for outsiders to get at the results. But whether the lamps be complicated or not complicated, cannot be expressed offhand here in this Institution. It is a matter which must be put to a practical test, and that will decide. I am pleased to see Mr. Silber is turning his attention to flashing signals. I shall be very glad if he can induce Her Majesty's Government to get a better kind of lamp. I have tried myself, but the Treasury always seems to stand in the way of those little matters. It is a pity that while Mr. Silber introduced what he supposes is a better flashing arrangement he did not give it to us in a complete form. He has introduced one of the many methods of using the eclipser, but he does not show us how he is to arrange it, considering that the lamp must hang upon gimbals perpendicularly, unconnected with the ship at all, except through the point of suspension. I do not mean to say that it is impossible to do it, but there it is. I have never heard, so far as I know, any complaint made of the simple eclipser which we now use—I do not at all mean to say that I will not back a better shade when I see it—I certainly will. The hand-signalling lantern which Mr. Silber showed us is not new in principle. I am glad to see Mr. Babbage's son here to-night, because I can bear testimony to the fact that the lamp now in use in the Army is practically Babbage's lamp. That thumb arrangement which Mr. Silber has shown us, which I have no doubt is borrowed from the present Army pattern lamp, that was Mr. Babbage's own arrangement, and a very good one it is. The lamp before us is simply a larger description of the present Army signalling-lamp—nothing more.

I should like to correct the gentleman who spoke about the Morse code. In the Navy the Morse code is not used; in the Army it is used. In the Navy a much more simple code of flashes is employed. I may express my own conviction that the time is close at hand when the Morse code will supersede the present simple system, which is my own introduction in the Navy. I say this after considerable thought. I know I am in the minority, but I think the time is close at hand when we shall see the Morse alphabet very largely used. I do not think it is quite so difficult, judging from all that I have seen, as the gentleman who spoke, made out. Possibly it may be for men over forty, but I do not think that it is necessary for men over forty to undertake it. The process of trimming of course is most important. The lecturer very properly pointed out the accidents which do occur from side-lamps—red and green bow-lamps—being removed for trimming just on the



approach of another ship; so that the other ship does not see the position of the ship approaching her, which is having its lanterns trimmed. I long ago came to a conclusion on that head, and I have not seen or heard anything to-night to alter it. I came to a distinct view that as you can get out of a candle the necessary power for the bow and mast-head lights, I prefer the simplicity of the candle to any arrangement of oil lamp, to Mr. Silber's, or any other arrangement that I have ever seen. You put your candle in the first thing at night, and take it out the last thing in the morning; there is no trimming in the case at all. I quite agree in the condemnation given to petroleum; I think it is most dangerous, and the assumed cheapness of it is not for one moment to be set against its danger. Mr. Silber spoke hoping that his labours might be of value. I am quite certain that they are of the very greatest value, and I hope that the lecturer will not imagine that in the criticisms I have felt it my duty to make I am at all disparaging what I know from personal experience must have been very intense labour, and have required very great perseverance. I have had some little experience myself in that matter, and I do not know anything more wearying to deal with than the flame of a lamp.

I quite agree as to the necessity of improving the arrangements for signalling. I think at night, even in the Navy, our arrangements are still defective. We have not any recognised system of signalling by night in the mercantile marine, and if the gentleman who spoke will produce his system, and if it will do what he says, all I can say is I will back him to the very fullest extent of my power. I think at this time of day it is a disgrace to us that while all the navies in Europe without exception, even the navies of Greece and Japan, have adopted a system of night signalling, that the great mercantile marine of England should be absolutely without one single means of communicating at night. If Mr. Silber can force that question into prominence, supposing the whole of the rest of his arrangements fail, he will have done very good work. I am not speaking of any particular system. If a system can be got which is available for the mercantile marine I hope we shall get it. There is one point relating to side lights which we should recollect. I do not think it is a good thing to have too great a range for the mast-head and bow lights, I think the range which is set down in the Board of Trade regulations is a very suitable and proper range. To have your lights so powerful that they can affect the movements of a ship five or six miles off I take to be rather a dangerous thing. The order is that the lights are to be visible, the bow-lights at two miles and the mast-head at five miles. The mast-head, of course, is nothing. The bow lights are the things by which you must act on seeing the ship; the masthead light does not give you any clue. I think it is very undesirable indeed that ships should act too soon, and I think the present range—lights showing clear for two miles at night is a sufficient range; and it is a pity to try to go beyond that. It is more important that the lights of all ships should be uniform; that is to say, that when you see a light it should give you some idea of its distance. If you have on board one ship very bright lights, and on board another very dim lights, you are always puzzled, when you come to act, as to the distance which the ship is off. I think it is much more important to get a uniform small light, so to speak, than to have some ships with very large ones, and others with very small ones. I was sorry to hear Mr. Silber speak so disparagingly of the light supplied to our seamen. I agree with one speaker who said that he did not think Mr. Silber had recently visited some of Her Majesty's ships. It is a point that struck me some years ago very strongly, and I hope in the course of time we shall see a better arrangement general. We have, so far as we know, got a system of lighting which will give more light and still save £12,000 a-year to the Government, which I hope may enable us to supersede the "rushlight" by, perhaps, one of Mr. Silber's lamps.

MR. LANGLEY: I spoke about the temperature of the oil being 10 or 20 degrees below the flashing point. The flashing point of petroleum is 100 degrees, and the temperature of the oil in the cistern is kept at 90 degrees and under.

May I ask one question? Captain Colomb spoke about petroleum, and the dangers attendant upon its use. He did not mention that there is belmontine, which will not flash at any point whatever, and is perfectly safe; you could put a match into it. I should like to ask Mr. Silber, whether his lamps would burn that oil?



Commander GILMORE, R.N.: I must join issue with Captain Colomb as to two remarks which he made, one the necessity of having a uniform light, and the other at a distance of two miles. With reference to the last point, at the present rates of speed at which our ships travel, two miles are very soon passed over, and I think, therefore, it would be advantageous for the lights to be visible at a greater distance than two miles. With reference to having the lights of an uniform power, I think it would be preferable to have a uniform light of great brightness rather than a uniformity of dimness.

Captain CROZIER, R.N.: It has been remarked by a gentleman that he did not believe there were 10 per cent. of the Officers and men in the Royal Navy who understood the Morse system. I do not believe that there are 5 per cent. of the Officers who do not understand it. I have been in many parts of the world, and I speak as I find it. I do not think that there are 5 per cent. of Officers in the British Navy who are unacquainted with the flashing light.

Mr. ARTHUR DIOSY, R.N.A.V.: Mr. Silber alluded to the necessity of the frequent retrimming of his lamps being obviated. Of course I stand at a great disadvantage in speaking so soon after Captain Colomb, who is perhaps the very highest authority on this question, but still I think I can back him up most emphatically. I dare say several gentlemen present have been in charge of ships when their safety depended on keeping the usual bright look-out and the lamps clear. For myself, I have had the honour of being lamp trimmer of a watch, though rather in an amateur capacity, on board of one of Her Majesty's ships, and I am sure that the amount of suffering and anxiety I had to go through with those miserable lights of the old service pattern was something tremendous. That is why I should be much obliged to Mr. Silber if he would explain by means of what apparatus he obviates the necessity of losing a large amount of time in having to meddle with the wick of the lamp, and occasionally spilling the oil and giving rise to those dangers which the lecturer has described. I am sure everyone who has had any experience of bow-lights will endorse this opinion, and if Mr. Silber's apparatus for filling a lamp without removing it from its place is a practical one, it has broken down one of the great difficulties which have been encountered in trimming the lights of a ship.

Mr. SILBER in reply said: The first question asked me was, as to the saving effected by the use of my lights. I avoided going into that question as much as possible, but light for light, as shown by the comparative results of tests made by William Valentin, Esq., engine-room and passage lamps effect a saving, light for light, of about 35 per cent.; in engine-room lamps, 32½ per cent.; gauge lamps, 46 per cent.; mast-head, bow, and single lanterns, 54 per cent., and in other various lamps a saving of 40 per cent.

With reference to the possibility of producing a larger light upon the system at present existing I must distinctly differ from what has been said. And I do so for this reason, that at a competition of the Society of Arts a medal was offered for the best lamp which could be produced for burning vegetable oil without the aid of a chimney, and the result showed that no competitor could produce a light equal to four candles. I think that is very good evidence that they could not produce it, and I will tell you the real reason. Every flat or circular flame hitherto supplied in a lantern had to obtain its oxygen to its outer and its inner mantle from the oxygen that was contained in the lantern itself; and for that very reason, whilst the process of combustion was going on, half consumed carbon was carried away, and so produced what was generally known by the name of smoke. Now the process which I have adopted is this, that the formation, or the admixture of the gases which produce the flame—the oxygen, hydrogen, and carbon—is completely effected before the flame issues from the cone. The whole lamp itself is practically sealed, so that there is no oxygen within the lantern, or only an inappreciable quantity, and if the experiment were tried it would be found that no flame of a similar size, that is to say, of such a practical size as that in my lamps, could be produced by the methods that are at the present moment in use all over the world.

About the signal lights and about the trimming I can only reply in this way. The

<sup>1</sup> Fellow of Chemical Society, Principal Demonstrator of Practical Chemistry in the Royal College of Chemistry, London.

lamps supplied to the Admiralty were guaranteed to act for eighteen consecutive hours, and to be watertight; that is to say, even if they played with a hose, of two or three inches diameter, upon the lamp the whole day they would not force a drop of water into the flame. I have not seen the reports made upon the lamps, but the Admiralty has ordered a much larger quantity of them, and has paid for those previously had. I think that is sufficient evidence that they are satisfied.

I feel very much gratified at Captain Colomb's remarks. Criticism on the part of Captain Colomb I look upon as a compliment, for I do not think there is another gentleman who has studied the question of lights for ships so much as he has. But I believe he is to some extent under an erroneous impression in saying that all my lamps must have an increased size. To some extent he is right, because the larger the flame the greater must be the circumference of the lamp. Of course in a room where one person could live comfortably, fifty people could not breathe. Some of my lamps, therefore, are larger in proportion according to the light. Now, as to the trimming, the question is this: to fit the lamps to the men, as Captain Colomb has rightly expressed it, therefore I have provided a wick of a certain size cut by machinery, perfectly level and perfectly smooth; and there is this fact, that if the wicks have a quarter of an inch cut out of four different places, the combustion with the wick so deranged is equal to what it would have been if the wicks were perfect. It would make no difference whatever.

Captain Colomb also alluded to a distance of five miles; that is the regulation distance for mast-head lights. I consulted Professor Tyndall on the subject, and he said, "I am perfectly satisfied with what you have done; continue in the same direction." I have also heard an objection raised, which has not been raised this evening, that it might be mistaken for a lighthouse; but Professor Tyndall said he was not at all frightened at that, and besides, with the arrangements they are making at the present moment for lighthouses, the lighthouse can be very easily distinguished from a ship.

The peculiar green of the lens of this starboard lamp is a very important matter. These lamps were tried at a competition at Shoeburyness, and I have a certificate in my hand which states—"One point, visible, bright; two, visible, bright; three, not quite so distinct; four, ditto; five, clearly visible; six, ditto; seven, bright; eight, ditto;" one point above being not so distinct, and two points ditto. "As to that showing more ahead than ten points, no." Of course that is satisfactory, so that this passed Shoeburyness as being a perfect lamp.

I was asked whether I had recently seen the lighting in ships. I asked permission of the Admiralty, and went recently on board H.M.S. "Thunderer," and also on the "Minotaur;" and, as I stated in my paper, I found that a dip light, certainly not thicker than my little finger, was fixed against the wall with a small piece of tin, and twelve men were sitting round the table, of whom eleven could not do anything, and the twelfth man was attempting to mend some article of clothing.

On the question of suspension I may say that the lamp balances itself; it is carefully calculated as to that.

Captain COLOMB: I meant you must connect your flashing arrangement through your point of suspension.

Mr. SILBER: That is a question of very great importance. I intended to do it by a bell-crank arrangement, to be so adjusted for signalling with the aid of cords as to make its action as simple as that of Captain Colomb's. I am not satisfied with the results in my own mind. It seems to me, at present, that the disadvantages so counterbalance the advantages that perhaps it may be quite as well left alone.

Captain COLOMB: You cannot use your lamp for flashing purposes unless you have that, because the slightest motion of the lamp will cause the shades to open.<sup>1</sup>

<sup>1</sup> Mr. Silber did not understand Captain Colomb to have made this last remark, or he would have replied that on the contrary no violent motion, no vibration of any kind, not even that produced by the discharge of guns on board, would cause the shutters to open, as they are locked by a rack and pinion as well as a screw bolt.

On the last occasion of Mr. Silber's visit to H.M.S. "Minotaur," Lieutenant Campbell, R.N., kindly showed him all the positions in which signal lamps used, and Mr. Silber has provided for his signal lamp being used in all similar positions.

The CHAIRMAN : I think we may now bring our proceedings to a close. Before doing so I wish to make one remark upon an observation that fell from Captain Colomb. He alluded to what he called the complications of Mr. Silber's lamps being too great for the men who would have to use them. Now I think, considering the state of complication of all our new ships, filled as they are with machines of all sorts, the great guns, as we heard here the other afternoon, worked by very complicated machinery, I think if the men are intelligent enough to be brought up to use all these machines, we need not despair of Mr. Silber's simple arrangements being used with intelligence. And I think my friend, Captain Colomb, rather contradicted himself, for in arguing with regard to the Morse signals he said there was no difficulty whatever. Now, I think, if a man can master the Morse signals he may very easily master the arrangement of Mr. Silber's lamps. I am sure we are all highly indebted to Mr. Silber for what he has brought before us. I certainly had no idea that there was so much to learn and so much to see with regard to these lights. The old "dip"—Mr. Silber called it a "rushlight"—is an old light we knew very well at sea. When I was on service formerly, I always felt that the way the lower and orlop decks and the interior of our ships were lighted was a perfect disgrace—it was quite lamentable to go down below in those ships and see the miserable horn lanterns we had to carry about, and the indifferent lighting where the men lived. I believe it is better now ; at any rate, if not, it ought to be. I maintain that every ship ought to be as light below during the night as if it were daylight. With these observations I am sure I am only doing my duty, as Chairman, in conveying to Mr. Silber our heartfelt thanks for the paper he has read to us.



# Evening Meeting.

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Monday, April 15th, 1878.

ADMIRAL SIR FREDERICK W. E. NICOLSON, BART., C.B., Vice-President, in the Chair.

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## STEAM-POWER *VERSUS* SAIL-POWER FOR MEN-OF-WAR.

By Captain P. H. COLOMB, R.N.

1. IN my Essay on the "Development of our Maritime Power," I have rested the propulsive force of our war ships almost entirely on their coal stowage, and on the means at disposal for their replenishment with coal in our own depôts. I have proposed that the sail-power of our war ships should be reduced to the position of a true auxiliary. We should, I have assumed, build our war ships without any reference whatever to sail-power; and after the design is completed, we should then furnish them with such a rig as should give them the least possible inconvenience in foul winds, and the greatest possible assistance in fair winds.

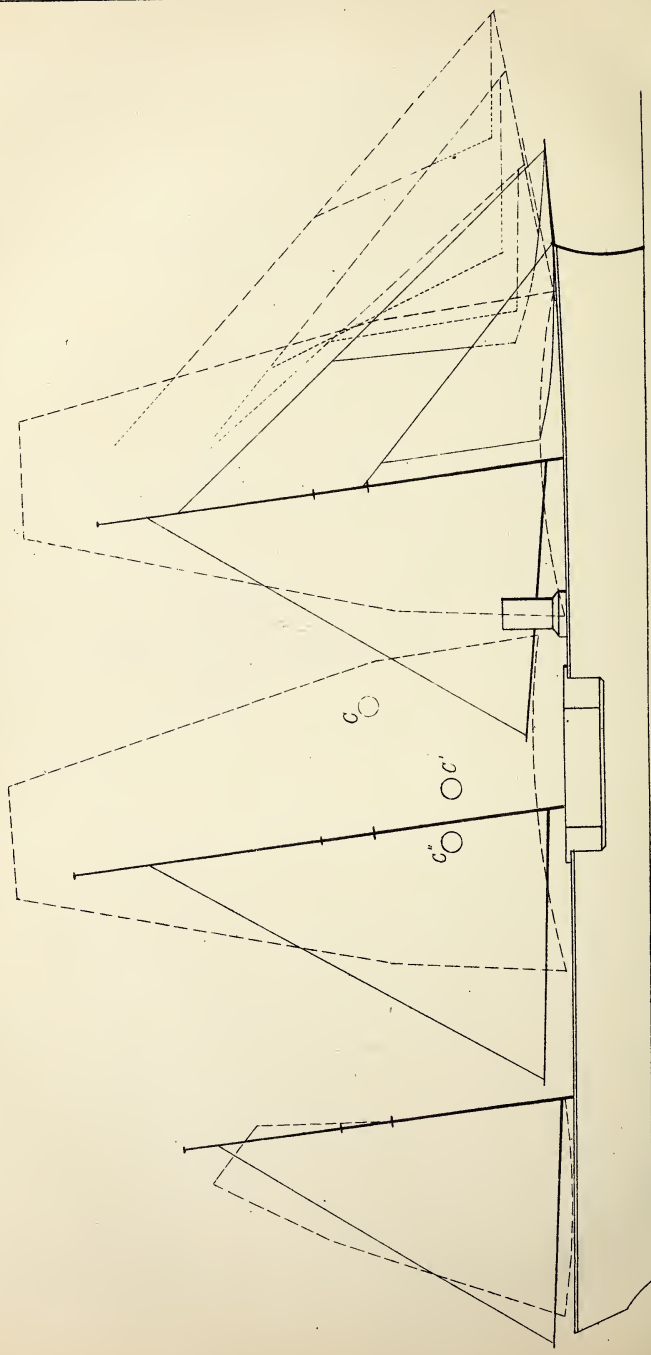
2. So bold a proposal requires some facts and arguments to back it, and I am here to-night to offer both for discussion.

3. Though a considerable change has passed over our minds within the last ten years in the view we have taken of the relative position of steam and sail power in a war ship, I am not without apprehensions of being considered rather too advanced in my present views. But I trust that those of my brother Officers who start at what may seem at first revolutionary theories, will understand that I do not advocate any sweeping changes without due experiment; and that I do not think we can advance at all, unless we do so on certain ground.

4. On the other hand, I have reason to believe that I should now carry with me a considerable body of steadily-formed opinions, were I to confine my views of the decadence of sail-power to the ironclad—or as I hope she may in future be called, to the Fleet Ship. I have been a little surprised to find what an alteration naval opinion has undergone in this matter even since I left England in 1874. These things make me hopeful that, though I may be too advanced at this moment, I shall be perhaps behind the age in five years' time.

5. But, in any case, whether I be too advanced, or altogether mistaken, in the views I put forward, there is great value in advancing them. I do not know any method of examining the soundness of old views better than testing their strength by the advancement of new ones. And, while I would always deprecate the ventilation of ideas which are simply wild, and rest on no definite data, I am a great advocate for the publication of all views which have such a foundation,

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even though the conclusions drawn may turn out to be wrong. I have, in short, a great faith in the accumulation of FACTS as a basis for argument, and believe that such accumulation is never made in vain.

6. The method I have adopted in this accumulation of facts may, I think, be relied on so far as it goes. It has involved some patient labour, but promises the advantage of being truly inductive, so that the facts established form a perfectly solid basis, whether the conclusions to which I think they point may or may not be approved.

7. Serving recently in an ironclad, I very early became impressed with the smallness of the results due to the employment of her square sails, but I was not at first prepared for the insignificant appearance their propulsive power would exhibit when investigated and compared with that of the engines; and most certainly I was not prepared to accept my present conclusions, which I may state were adopted by Captain Fisher as far back as 1871.

He then wrote:—"Masts and sails should be done away with. The weight and room they now represent should be taken by coal. No better proof exists of the wisdom (the economy and efficiency) of doing this, than pointing to the example of all the new ocean steamers, amongst the most successful of which are Mr. Holt's. These steamers, built more for cargo than speed, make the passage from Liverpool to Singapore in 45 days, and they carry 90 days' coal. A paper might be written to prove the actual waste of coal caused by masts and sails in squadron sailing, due to the frequent stoppages and alterations in speed; and it may almost be asserted, as a general rule, that the cost of refitting exceeds the value of the coals, which would have been used in the year's cruise had steam alone been used."

8. I have, in fact, made a long series of the calculations imagined by Captain Fisher, and the results are, to my mind, nothing less than startling in their confirmation of his views.

9. But, for investigations of this sort, the experience of the Channel and Detached Squadrons must generally prove exceedingly misleading, for their proceedings and movements are usually governed by their interior convenience, and not by the pressure of circumstances outside them. The test which is required to finally establish the proportions of sail and steam power proper to a modern fighting ship, is that of war; but very often the ordinary service of a foreign station so closely resembles a state of war, that useful conclusions may be arrived at, even in peace time. When the movements of a ship are governed by circumstances outside herself; when she must be at certain places at certain times without any reference to her interior convenience; the real value of her propulsive powers becomes apparent, and she establishes facts relating thereto, which, if carefully investigated and recorded, become an excellent and reliable guide for the future. A Fleet Ship on a distant station, with a good deal of sea work, and almost always impelled from point to point by considerations which, if less imperious than those developed by war, still in some degree represent its demands, appears calculated to furnish some of the most useful experimental data available in peace time.

10. In order to get at some definite results, I determined to investigate very closely the value of the sail-power of such a ship during a period long enough to make a fair average. I selected two complete years, ending on the 28th October, 1876.

11. The questions to which I have endeavoured, by an appeal to the actual facts, to get answers, are the following:—

(a.) The hull, engines, and boilers of the ship being considered fixed quantities, the variable elements of her propulsive power are the coal supply and the masts and sails. The masts, yards, and sails, actually in use, represent a certain weight, and they also induce further weight in the shape of stores; and in the ship in question, a very large additional weight in the form of ballast. Do the sails in their propulsive power represent the equivalent of the weight they involve?

(b.) If it appears that they represent a power in excess of this weight in the form of increased speed, or decreased coal consumption, then it is clear that sail-power is properly arranged. But if it is found that even in peace time, and in ordinary service, the propulsion extracted from sail-power does not reach the equivalent of its weight, it would appear that a re-distribution is required.

(c.) If the sails upon the whole make a loss, instead of a gain, in propulsion, should we not look to their inconvenience to a fighting ship in time of action, and also to the increased draught of water of the ship?

(d.) Taking the lowest view of the question, that of simple saving of money, and supposing still that sail-power as arranged shows a loss stated, say in tons of coal, will not the debit side of the account be very much increased by the cost of wear and tear, and by the interest on capital sunk in the rig?

(e.) If we decided that in any particular ship the existing rig showed a loss, is there any modification of that rig which would give us the maximum of assistance when the wind was fair, with a minimum of retardation when it was foul?

12. It was some time before I succeeded in establishing satisfactory rules for calculating the value of sail-power, but I think those which I finally adopted may be applied to any ship with confidence. The rules are simple, and the process of calculation, though laborious and troublesome, is not difficult, and does not involve any abstruse problems.

13. Table I is one of forty-five which were completed for the purposes of this paper, and its construction may be now described.

(a.) The distances through the water as logged hourly are taken out and totalled, the totals being placed in the columns for distances under steam alone, steam and sail, and sail alone, opposite the number of hours occupied in passing over each distance.

(b.) The coal burnt while actually steaming is placed opposite each distance run under steam alone, and under steam and sail.

(c.) The coal expended in banking fires and waiting orders is omitted from this column, so that when the ship is under sail alone this column is blank opposite that distance.

(d.) The coal saved or lost, and the miles gained or lost by the use of square sails, are calculated in this manner. The best data which

can be had under steam alone are selected, care being taken that the time and circumstances correspond as nearly as possible with those under square sails, in order that the estimated loss or gain may be accurate; and doubts are generally given in favour of the square sails. The coal saved by the stoppage of the engines, when under sail alone, is debited with any charge against the saving which may exist on account of banked fires, waiting orders, &c. The saving or loss thus obtained is placed in the proper column with the plus or minus sign. The miles gained or lost are obtained from the same data, and are placed in the proper column with the plus or minus sign. Thus, for example, taken from the table:—The ship on the 4th June, 1875, was under sail alone for ten hours, making 37·6 miles through the water in that time. The fires being banked, ·75 tons of coal were expended. Now, from a mean of the ship's performance under steam alone, under similar conditions of wind and weather on the 6th and 7th of June, it was found that she went 6 knots at 5·3 miles to the ton of coal. On the assumption that she would, had not square sails been set, have gone for ten hours at the rate of 6 knots, and an expenditure of 1·12 tons per hour, we find that the ship lost 22·4 miles in speed by the use of sails alone, but saved 11·2 tons of coal, from which the ·75 ton used in banking being subtracted, she is left with a nominal gross saving of 10·5 tons of coal, and an actual loss of 22·4 miles in speed.

(e.) The method pursued in calculating the loss or gain by the use of square sails when steam is also in use is somewhat similar. Referring to the table, we see that on the 12th June the ship was four hours under steam and sail, and ran 31·9 miles in that time. Just before making sail she was going, under steam alone, 7 knots for 32 cwt., or 4·4 miles per ton. The use of the square sails in those four hours, therefore, increased her speed by 3·9 miles, and saved coal to the extent of 0·1 ton.

(f.) The value of sail-power is most conveniently spoken of in tons of coal; and throughout the tables the miles lost or gained on the passage are, at the end of it, turned into tons of coal at the rate due to each particular case. The same data are used to establish the gain or loss of miles or tons, and afterwards to convert miles into tons. Thus, the above 22·4 miles lost, at 5·3 per ton, gives 4·2 tons to be subtracted from the 10·5 tons appearing as saved, thus leaving the actual gross saving due to being ten hours under sail alone at 6·3 tons.

(g.) At the end of the Passage, all the particulars given in the tables are summed up, as in Table I. "Total consumption of coal for engines" represents the expenditure for steaming, banking fires, raising steam, and waiting orders. The "consumption of coal, steam-ing" is the result of the sixth column in the tables, and is the coal actually used in propelling the ship over the distance given. The "consumption of coal for all purposes" includes every expenditure of coal for any purpose during the Passage.

(h.) The times, distances, and consumption of coal, being thus summed up, are used to take out the average speeds under steam alone, steam and sail, sail alone, and under all the circumstances of the



Passage. The mileage under steam alone; under steam and sail; and under steam, and steam and sail; is then taken out from the coal burnt under those circumstances. In calculating the mileage per ton on the Passage the consumption used is that for engines, including banked fires, laying fires, and waiting orders.

(i.) The total gross saving of coal by sails is the result of the seventh and eighth columns in the table, calculated as before mentioned. The gross percentage of saving on consumption, is calculated on the expenditure of coal for all purposes.

(j.) The abstract given in Table II is a summary of twenty-eight primary tables, of which a specimen is given in Table I, with some additions. Item No. 9, for instance, is taken directly from the engine-room registers, and gives the coal used for all purposes during the whole period covered by the table. Items 12 and 13 are taken out from the primary tables specially for the abstract. The "coal nominally saved by square sails," and the "miles actually lost by square sails," are the sums of the seventh and eighth columns in the primary tables, while the "gross percentage" is taken out from the coal shown as used for the engines, and for all purposes respectively.

14. Table II thus represents the actual facts as to the relation between the propulsive values of steam-power and sail-power, in an ironclad on foreign service of a somewhat varied kind, during two full years of her commission. On these facts I base my conclusions as to the distribution of sail-power in the Fleet Ship, and I think it must be admitted that they are sufficient.

15. The most extraordinary fact brought out is given in item 26, where it is shown that on the whole no more than 7 *per cent.* can be put as the gross saving of coal due to the use of sails; and it is, perhaps, necessary to state that not a moment was ever lost in making sail whenever it was possible to use the square sails with effect. From this miserably small gross saving, all the *per contras* must be taken; namely, the loss due to the weight of masts, yards, sails, and ballast, the retardation due to the fixed area of masts, sails, and rigging when steaming against foul winds, as well as other losses not here to be adverted to. Thus, we see that on the face of things, and at the first blush of the matter, the sail-power *must* involve an actual loss of coal, and it only remains for us to calculate the amount of the loss as nearly as may be.

16. Let us take first the question of immersion due to weight. We know that masts, yards, sails, and ballast weighed together 520 tons—more than half the weight of the armour, and nearly half as much again as the weight of the guns and ammunition. Now, considering the speed as given, the consumption of coal may be roughly assumed to vary as  $D^{\frac{2}{3}}$ , where  $D$  = displacement. Taking the existing displacement at 6,034 tons, and what it would be were the sail-power entirely removed at 5,514 tons, we have,

$$6,034^{\frac{2}{3}} : 5,514^{\frac{2}{3}} :: 5,162 : x,$$

5,162 being the number of tons actually used in steaming during the two years. This gives us  $x = 3,861$  tons, which, subtracted from the

5,162 tons actually used, gives 1,301 tons as the loss due to the simple weight of the mast, yards, sails, and ballast. I may remark that these figures are quite confirmed by actual experiment in the ship on repeated occasions. The difference of coal consumption for a given speed, at different immersions, varied as nearly as possible in accordance with the above law.

17. But by Table II the gross saving due to the use of square sails was only 453 tons of coal. The net loss, therefore, due to the sail-power was 848 tons of coal from the item of their *weight* alone.

18. But a little reflection will show us that the case against sail-power is on this head alone still worse than these figures show it to be. In calculating the primary tables, whence the abstract in Table II is drawn, we have really put all the fair winds to the credit of sail-power, and all the foul winds to the debit of steam-power. This follows from the fact that square sail was invariably set whenever the sails would stand. Thus, we have supposed that whatever the strength of any fair wind might have been, it would not have helped the ship in the least, unless the square sails had been set. This is assuredly a most incorrect hypothesis, for a fair wind invariably makes an immediate increase of speed, as well as a reduction of consumption.

19. But passing this by, we have to assign some value to the loss of coal due to the resistance of the spars and rigging when steaming head to wind. I do not know of any precise data on this head, and I do not know of any means by which such data can be obtained, short of a long and varied trial of the same ship at first without her spars, but with a weight corresponding thereto; and afterwards with her spars complete—the corresponding weight being removed. Such an experiment we are most unlikely to have, and we must, therefore, assume some figure which will certainly be within the mark. The ship expended while under steam alone, 4,201 tons of coal in the two years. Is 5 per cent. too large an allowance? Supposing the ship going five knots, and a head wind sprang up reducing her speed to four knots, that would represent a common occurrence, in any ship of war, and would represent a total loss of 20 per cent., part of which would be due to the resistance of the spars and rigging, would it be unreasonable to say that one-fourth of the loss represented this part? I suspect that 5 per cent. is not an unreasonable allowance for loss due to resistance of spars and rigging when steaming over any considerable distance head to wind, or in calm. But to be safe, I should put it at about 4 per cent., or at 152 tons of coal. This makes our total loss of coal due to sail-power just 1,000 tons, or 500 tons a year; which, at an average foreign price, involves a money loss of £1,150 per annum.

20. As the total consumption of coal for all purposes was 6,734 tons, we find in answer to question *a*, in par. 11, that so far from the sail-power of such an ironclad as we have been considering, representing its equivalent in weight, it actually involves a loss of more than 14 per cent. We may, therefore, at once answer the second question, *b*, and say that looked at from this ground alone, a re-arrangement or re-distribution of sail-power is required.

21. We have next to consider whether the increased draught of water due to the weight of spars and sails, &c., is not a serious inconvenience to a war ship. This must, I think, be at once admitted. The 520 tons which sail-power and ballast represents in such an ironclad, is equivalent to about 16 inches of draught, and when I have said that, I have said all.

22. As to the inconvenience of full rig to a fighting ship in action, opinions will no doubt differ. We happen to have an instance before us, by way of experiment, which seems to cut so accurately both ways, as to leave the argument just where it stood. The German "Meteor," off the coast of Cuba in 1870, fought the French "Bouvet." The German planted a shell in the "Bouvet's" boilers, and, observing her helpless condition, ran down to make her an easy prey. But the "Meteor's" wounded masts fell and fouled her screw; rendering her just as helpless as her antagonist. The "Bouvet" then, by the use of her sails, crawled away into neutral waters and saved herself. On this experiment, one side will argue that had the "Bouvet" not been provided with a full rig, she would have fallen a prize to the "Meteor," while the other side will urge that had the "Meteor" been without rig, she would have captured the "Bouvet." I am content to leave these arguments where they stand, observing simply, that as each may be maintained with equal force of logic, I prefer to take up the ground put forward in my essay, which would give the "Bouvet" a second chance with her steam. If she had been so arranged that a single shell would not have absolutely paralysed her steam-power, she might have used her reserve steam-power to capture the "Meteor," rendered helpless by her supply of sail-power.

23. We come now to the lowest part of the question—I mean lowest in theory—but recent years have taught us that it may in practice become the most important of all. I mean the money question. We have already seen (par. 19) that we cannot put the direct extra expenditure of coal due to sail-power, at less than 500 tons a year, or at an average foreign price, at £1,150. We must clearly add to this, interest on original capital sunk in rig; and the wear and tear. I think I am within the mark—perhaps considerably—when I place the value of such a full rig as we are considering at £5,300, and if we allow interest at 4 per cent., we should get the annual cost put at £212. I suppose we cannot put the wear and tear at less than 7 per cent., which would give us a yearly charge of £371. We thus get the direct cost of the full rig put at £583, which, added to the indirect cost already calculated, puts the total cost of the sail-power as supplied to a second class ironclad as £1,733 per annum. When we turn to the Navy estimates for this year, we see that these figures thus applied to a single ship, cannot err very greatly when applied to the whole Navy. We find that the coals purchased at home for ships' use are to cost only £99,800, while hemp, canvas, and minor articles are to cost £137,400. It is true that much coal is purchased abroad, and that a considerable part of the £175,000 which is to cover all purchases abroad, will go in the one item of coal. But even if the whole of it went in coal, it would not upset the figures.



24. Up to this point, all the facts and arguments go to show that a re-arrangement of the rig of the ironclads is clearly desirable, if we are not prepared to send them to sea as practically mastless hulks like the "Devastation," which I for one am not prepared for. The question next to consider is, what should be the nature of this rig? Regarding the sail-power proper to be supplied to a ship of the type under consideration, as altogether subordinate and tributary to the steam-power, what distribution may be made of the former to give the greatest assistance to the engines at the smallest cost and inconvenience? It is to be observed that there are in the present rig two kinds of sails, the fore and aft, and the square. When the square sails are at their best, the fore and aft sails are at their worst, and *vice versa*. Here there is direct loss; for the weight of each kind of sail becomes a drag when the other kind only is in use. Hence we should aim at such a description of sail as might be equally used whether before or close to the wind. Regarding the possible improvement of the rig of our ironclads from this point of view, we come to the question of areas of sail, which gives us some pretty subjects for thought. We may remember that "*area of sail*" is, for a given wind, an expression for sail-power exactly corresponding to the "*indicated horse-power*," for steam-power. Reductions, or increases in area of sail, must be expected for any given wind, to represent reductions or increases of speed under sail, exactly corresponding to those due to equivalent reductions or increases of indicated horse-power, when under steam. This makes us recall to mind that a reduction in the area of sail will not effect a corresponding reduction of speed under sail. Then, if we start with the understanding that sail is not to be considered as a substitute for steam, but rather its assistant, then we can say that it is possible a reduced sail area will affect an increased speed, first under steam alone, and secondly under steam and sail, both because of the reduced displacement of the ship to be propelled. If we reduced the area of sail by one half, and found that we were thereby able to reduce the draught of water by one foot, it might turn out that the increase of speed due to this reduced draught was greater than the reduction of speed due to decreased sail area.

25. It must not be forgotten that a very great part of the weight of present spars and rigging is due to the existence of light and lofty sails. But practically these—unless we could adopt the sound policy of the mercantile sailing marine, and make our top-gallant sails the largest sails in the ship—are of exceedingly small propulsive power. At a time when such sails could be taken into account, as sensibly assisting propulsion, they must come in. Neither the canvas, nor the spars, are capable of meeting a fresh breeze. So that if we decided to considerably reduce the area of sail in an ironclad, we might, in the first place, not decrease the speed sensibly in light winds, while we might even increase it in strong winds by showing a greater area of sail than is possible under the present system.

26. Let us apply these considerations to the case in hand. The ship in question spread an area of plain sail equal to 24,092 square feet. With the wind abeam under sail alone, and when plain sail—

less royals, flying jib, and spanker—strained the spars to their utmost, I got a speed of 8·2 knots out of her, being the best she had ever done. The area of sail was then 19,169 square feet. If it had been reduced to 14,500 square feet, we should have had the following results, considering the areas of sail, as corresponding to their equivalent indicated horse-powers.

$$V^3 : v^3 :: A : a,$$

where  $V$  and  $v$ , are the speeds due to the original and reduced areas of sail; and  $A$  and  $a$ , are the areas themselves, the force of the wind being constant. Therefore:—

$$(8\cdot2)^3 : x^3 :: 19,169 : 14,500, \text{ and } x = 7\cdot47 \text{ knots.}$$

Then it has to be remembered that as this reduced sail area involves a decreased displacement, the loss of ·73 knots would very likely be lessened by the decreased area of immersed midship section. If, for instance, we reduced the weights carried by 460 tons, we should expect to reduce the loss to only ·6 of a knot.

Perhaps the most effective sail area is spread under the present system, when all studding sails are set on one side, with the lee clue of the mainsail. The area is then about 22,790 square feet, of which about 5,780 feet belong to the studding sails. When the strength of the wind is such that the royals and top-gallant studding sails cannot be set, and when topmast studding sail booms begin to go—the ship will make 8·5 knots, the area of sail being 19,862 square feet. A sail area reduced to 15,500 square feet, and a correspondingly reduced displacement, would give a speed under sail alone of 8·08 knots.

27. Actual experiments as to this, the equivalents of sail area and indicated horse-power, would form exceedingly valuable data, for we can say of no theory that it can be applied to practice until actual practice has taught us the fact. The few experiments I have been able to carry out give me no cause to doubt the practical utility of the theory. Thus, I found that when an area of sail equal to 25,617 square feet gave me a speed of 6 knots, an area of only 6,986 square feet gave me a speed of 4 knots. Increasing the area to 17,595 feet only increased the speed to 4·8 knots; and increasing it to 21,815 square feet brought the speed up to 5·5 knots.

28. Supposing, therefore, that on all the grounds set forth, it were determined not to withdraw sail-power altogether from the ironclad, but only to modify it, what is the best modification? I have, till better advised, pinned my faith on leg-of-mutton sails, arranged in a similar manner to those shown in the diagram. The main feature of the proposed rig is the abandonment of yards and gaffs, and the substitution of booms. In the diagram I have given in dotted lines the present rig of the example, and in black lines the proposed rig. The lower masts would be of iron, fore and main 78 feet from deck to cap, mizen 6 feet less, and all three of a diameter suitable to the greatly reduced strain which will be thrown on them. The booms should also be of iron, fore and main 76 feet long, mizen 69 feet long and of suitable diameter. The topmasts should be wooden, slight, in

correspondence with the small strain they are to bear. The booms, instead of resting on a saddle, with jaws round the mast, would work on a universal joint on an arm extending some little distance abaft each mast, and well stayed and supported. The object of this arrangement is to allow the booms to come perfectly square when against the after swifter. By means of these masts and booms, three triangular sails would be set, to be made say of No. 2 canvas. The fore and main alike, with an area of 4,270 feet to each, the mizen with an area of 3,379 square feet. Forward, a jib-boom without bowsprit would be rigged out 27 feet from the knight-heads, and carrying a jib of about 1,392 square feet in area. A staysail would set on the fore-stay as at present, with an area of 1,193 square feet. The total area of these sails would be 14,504 square feet, which, considered as a fore-and-aft rig, compares favourably with the present one, which is but 9,592 feet in area. To these standing sails would be added a single studding sail forward of a triangular shape, the tack to go to the lower boom end, the head to the topmast head, and the sheet inboard. The lower masts should be supported by three shrouds of a side, one carried well forward to act as stays, and one carried aft, but only to the line of the jaws of the boom. Each lower mast should also have the after support of a shifting backstay on each side to set up with a screw and slip, so that the weather one could always be in use. Topmasts would be secured in like manner.

29. So far as I am able to judge, the chief objection to this rig would be its novelty. We should find it difficult to divest ourselves of a longing for our accustomed spars and sails, and for our pretty morning and evening evolutions. No naval man can part with these old friends without a pang, and without sincere wishes that the progress of time, and of busy—perhaps too busy—brains would let us alone. But if these too busy brains *will* establish new conditions, it is most certainly the duty of the naval Officer to cast aside any regrets, and to bravely suit himself and his ideas to the new conditions which others have established for him. We did not of ourselves invent the steamship, nor yet the ironclad and her many-tonned guns; but these things being the tools put into our hands, it is idle to cast longing looks at those so familiar to us in a past age. We must resolutely set our faces and bend our minds to the task of fitting ourselves to the new implements, and we must not fear to forsake old methods and old ideas, so soon as they are shown to be obsolete. My experience of the naval Officer is that he can fit himself to anything, and that no material changes in his tools will alter his character, or make him less “naval” than he always was, and is now. Hence, although few in the Navy have the opportunity or the leisure to make such calculations as I have put before you, and although the many would not, for a long time, perceive the full bearings of my case, I am more deeply in error than usual, and have forsaken my ordinary methods of reasoning, if the idea of novelty attaching to the new rig would be very lasting.

30. But in order to meet such objections as may be raised at the outset, I may observe that I do not anticipate much difficulty in



working these sails, for, large as they undoubtedly are, the fore and mainsails only contain 530 feet more area than the present square mainsail, and any one who has had experience of a brig's boom mainsail, will recall to mind that the largest sail in the ship was the easiest to manage. I should propose that the feet of these boom sails should travel out with clips upon a T-iron feather running the whole length of the boom; and if there ever were difficulty in taking the sails in by an inhaul and brails, easing the boom sheet over would spill the sail and allow it to come in. Permanent braces, representing "lazy guys," would lead from forward aft to each boom on each side of the ship, but would not be brought into use until the booms were eased well over. The boom sheets would be double, one on each side, so as to steady the booms when near the wind. Both braces and sheets, instead of being attached in the usual way, would be run out to the boom-end, or to suitable positions by means of outhauls; the blocks being hooked to clips travelling on T-iron feathers on each side of the booms. In this way, braces and sheets could be hooked and run out, or run in and unhooked as might be necessary. Topping lifts would be fitted double, in the usual way.

The main and mizen booms would form the derricks for hoisting boats in and out. The fore boom would require topping to clear the funnel whenever the tack was changed, but I believe this would not be a serious inconvenience.

The boom sails would have the usual three reefs, but I think it would be preferable to fit them as the reefs of square sails are now fitted, with beckets and toggles on the travelling clips, the slab reef being gathered in by slab lines, as in the square sails. I should not think it necessary to fit storm sails, as the reduction of sail due to reefing would be so great. The luffs of the boom sails would travel with hanks or lacings on a wire jackstay coming down from the topmast head, set up to the deck, and supported at intervals by arms from each side of the mast.

31. Having thus detailed the facts of the relations between steam and sail power in our existing Fleet Ships, and having described the modifications I propose in the arrangement of sail-power to agree with these facts, I may pause a moment to recapitulate. In reducing area of sail, and altering the rig, I have, in the first instance, reduced the heeling power of the sails; and, secondly, the length of the lever at which that power acts. The centre of effort in the new rig is 23 feet below its place in the old one. All this means that the 360 tons of ballast placed in this class of ship may come out if the new rig is adopted, and as the latter will weigh about 100 tons less than the old rig, we find that we have freed the ship of no less than 460 tons of dead weight. Under present arrangements, such a ship is unable to steam 1,500 miles against a head wind, by reason of her short coal supply; I should certainly look on the work as but half done if none of this spare weight were taken to increase the coal supply. Say that the ship now carries 460 tons of coal and steams 4 miles per ton, she then has 1,840 miles in her bunkers; add 100 tons, and we give her 2,240 miles. But then, as we remove 360 tons of dead weight, while

we give her this 100 tons more coal, it is certain that we shall increase her mileage per ton very largely. But if we increase her mileage per ton, it is also certain that we shall increase her speed per ton, and hence she can either steam a longer distance at her present speeds, or the same distances at increased speeds. Hence, if the power of locomotion is an important factor in the Fleet Ships, the appeal I have made to fact shows us how to get it. In the matter of mere money saving, the case is perfectly clear in the new rig. It will cost less to begin with; its wear and tear will be less; and its drag upon the steam-power will be insignificant. Whenever the wind is fair and strong, the new sails will give her very nearly, if not quite, as much help as the old ones, but the loss when the wind is foul and strong will not be noticeable. This is the favourable side of my argument. There are very important *per contras*, as every one knows, but I shall not advert to them at this moment.

32. In my essay I have taken up the strong ground of recommending the new rig for every ship in the Navy. That I have done in order to raise a distinct issue, and I should have held myself in order had I raised it without any more facts than those already stated at my back. But though my facts are by no means complete, I can produce some which go far to justify me in believing that those which I have given in relation to the Fleet Ship will be found more or less applicable to every ship in the Navy. That is, that in general, the propulsive power of our square sails, put into competition with the steam-power, does not reach the loss involved in their weight, in their retarding power in foul winds, and in the consequent diminution of coal supply.

33. I have taken as my example a sloop whose steaming powers were low, but whose sail-power was about four times as great in proportion to displacement as that of the Fleet Ship, and I think that she must under these circumstances give data which will at least go to justify my views. In the first passage of this ship examined by me she went from Malta to Port Said, 1,029·8 miles through the water, of which 644·1 were done under steam alone, and 385·7 under sail alone. She burnt 22·6 tons on the passage, and her nominal saving of coal by the use of her sails was 19·1 tons; but she lost 241·0 miles in speed by her sails, so that her gross saving was only 7·6 tons. In her next passage from Suez to Aden she made 617·8 miles under steam alone, and 805·3 miles under sail alone. She nominally saved 33·5 tons of coal, but as she lost 374·7 miles in speed by using her square sails, her gross saving was only 11·3 tons. Her next passage from Aden to Trincomalee is the most favourable for sail-power that I have yet met with. She only steamed 494·9 miles, while she sailed 2,051·6 miles. She saved 94·2 tons of coal, and gained 64·1 miles in speed, so that her gross saving of coal was 97·1 tons; and while she only burnt 22·7 tons on the passage, it may be said that she must have burnt 119·8 tons had she not had sail-power. But this is just the point which I offer for discussion. The ship on this passage ran before the strength of the monsoon for fourteen days out of the twenty-two occupied in all. She never had, from first to last, any head winds unless they were very light, and so she had all the advantages of her sail-power, and none of its disadvantages. Now I must observe

that the exigencies of war cannot wait for fair winds, and that had this ship been ordered by such an exigency to retrace her steps, she could not have done it, and the reason why she could not have done it was because of this very sail-power which has here so much benefited her.

34. But passing this by, let us note how exceedingly unfair on the side of sail-power we have been in our estimate of her gross saving of coal. The datum on which it is calculated is the steaming power of the ship against a light foul wind. If the ship had crossed in the north-east monsoon instead of the south-west, and had met light foul winds the whole time, then she could have steamed at the same speed as she now ran before the wind, from Aden to Trincomalee, for 119·8 tons of coal. It is clear, however, that even if my example had had no sail-power whatever, she would not have used that amount of coal in the south-west monsoon, for the fair wind would have both quickened her speed and reduced her consumption. On the other hand, with the lighter and reduced rig which I propose for her, her speed under sail alone would not have been greatly reduced, while had she made the passage under steam and sail, which would, in my view, be the normal condition under the circumstances of this passage, she would have spent but little coal, and would have greatly increased her average speed. The ship was a twin screw, and I believe it may be assumed that with a single screw going, and fore-and-aft sails set, a twin screw may expect to double her mileage per ton at ordinary speeds. In the Fleet Ship it was so, and if it would be so in my present example with her new rig, we must suppose that she would have got 44 miles per ton of coal, and would have spent but 57 tons on the passage. Probably, also, her average speed, instead of being but 4·8 as it was, would have reached 6 knots or more. But the strong point of all is that the ship as she stood would have been unable to steam from Aden to Galle in a calm, whereas with the reduced sail area and increased coal supply, which I propose for her, she would have done so with ease.

35. As I have pointed out in my essay, I found that the sail-power of this vessel when traced through a distance of 6,100 miles actually reduced her speed 14 per cent., and that it was impossible to raise the gross saving of coal—even allowing nothing for her reduced speed—above 37 per cent. If we consider that this ship was unable to face, under steam alone, a breeze to which she could show all plain sail, we get a very strong feeling that the gross saving—even were it nett—would be too dearly purchased. When again I extended my investigations to fifteen months of this vessel's service, I found that her gross saving kept continually falling, and could not be raised beyond 5 per cent. for general service. Against this must of course be set the *per contras* already mentioned, so that we are able to say with some confidence, that the sail-power of this ship reduced her speed, and cost the country more than if it had not existed, and the ship had been mastless.

36. I have another set of eight tables taken for a single screw ship of rather under 900 tons, whose sail area was about 9 square feet per ton of displacement. The sacrifices she made in favour of sail-power



were draught of water and armament. She drew 5 feet more water than the ship just examined, was half as large again, but her armament only weighed 16 tons 2 cwt. against the other's 11 tons 7 cwt. In calm this ship could get 4 knots, with a mileage of 30 to the ton, but in head winds she fell off to 14, and  $8\frac{1}{2}$  miles per ton. The ship had a lifting screw, and perhaps it may be said that in her, sail-power *versus* steam-power had their case dismissed, each being as fully developed as the interest of the other allowed. A fair wind without sail would raise her steaming powers to 7 knots, and 43 miles to the ton. I traced this ship over about 10,800 miles of water, and got a gross saving of 111 tons of coal out of 441, or a gross saving of 25 per cent. But as to effect this gross saving, she lost 722 miles, or nearly 7 per cent. of her speed, it is more than probable that the real gross saving of coal was inconsiderable, and that there would be no nett saving, or perhaps a nett loss, when the increased displacement due to at least 30 tons of rig, and its retarding effect in head winds, was brought to account.

37. On the whole, it must I think be admitted that though I may be rash in committing myself to the abandonment of the square rig of our ships of war, my rashness has some method in it, and that it is not altogether impossible that I may be right.

38. Some paragraphs back (par. 31) I spoke of the facts and arguments which lie against the position I have taken up, but I have thought that those would come better out in discussion, and in this paper I shall not raise them.

TABLE I.

Date.	Hours under weigh.	Distance under			Coals burnt.	Coals saved or lost.	Miles gained or lost.	Remarks.
		Steam alone.	Steam and sail.	Sail alone.				
June 2	19	101.1	..	..	Tons. 17.6	Tons. ..	..	<sup>1</sup> Two hours steaming round target. <sup>2</sup> Data. Understeam alone in calm on 6th and 7th, 6 knots for 35 revolutions, and 22.5 cwt. = 5.3 miles per ton.
" 3	24	74.8	..	..	23.7	..	..	
" 4	14	47.7	..	..	13.8	..	..	
" 5	10	..	..	37.6	..	+10.5	-22.4	
" 5	3	..	..	5.5	..	+3.3	-12.5	
" 5	1	..	5.0	..	0.9	..	..	
" 5	12	57.7	..	..	11.9	..	..	
" 6	8	48.0	..	..	8.4	..	..	
" 7	11	61.6	..	..	11.7	..	..	
" 8	4	19.0	..	..	3.9	..	..	
" 10	16	91.1	..	..	16.6	..	..	<sup>3</sup> Data. Just before making sail, 7 knots for 42 revolutions, and 32 cwt. = 4.4 miles per hour.
" 11	24 <sup>1</sup>	132.6	..	..	26.5	..	..	
" 12	13	79.8	..	..	19.1	..	..	
" 12	4	..	31.9	..	6.2	+0.1	+3.9	
Totals .	163	713.4	36.9	43.1	160.3	+13.9	-31.0	

Total distance through the water .....	793.4 miles.
Time under steam alone .....	145.0 hours.
"    "    "    and sail .....	5.0 "
"    "    sail alone .....	13.0 "
Total consumption of coal for engines .....	181.0 tons.
Consumption of coal steaming.....	160.3 "
"    "    for all purposes .....	196.2 "
Average speed under steam alone .....	4.9 knots.
"    "    "    "    and sail .....	7.4 "
"    "    "    sail alone .....	3.3 "
"    "    on passage.....	4.8 "
Mileage per ton under steam alone.....	4.6 miles.
"    "    "    "    and sail .....	5.2 "
"    "    "    "    and steam and sail.....	4.6 "
"    "    on passage .....	4.2 "
Total gross saving of coal by sails .....	8.2 tons.
Gross percentage of saving on consumption .....	4.1 "

TABLE II.

*Abstract of Tables showing the Value of Sail-Power in H.M.S. "Audacious," for the two years ending 28th October, 1876.*

1. Total distance through the water.....	23,304 miles.
2. Distance under steam alone .....	16,039 "
3.     "    "    "    and sail .....	5,430 "
4.     "    "    sail alone .....	1,835 "
5. Total time under weigh (4,858 hours).....	202½ days.
6. Time under steam alone (3,351 hours) .....	139½ "
7.     "    "    "    and sail (920.5 hours).....	38½ "
8.     "    "    sail alone (576 hours).....	24 "
9. Total consumption of coal for all purposes .....	6,734 tons.
10. Consumption of coal for engines.....	5,568 "
11.     "    "    steaming .....	5,162 "
12.     "    "    under steam alone .....	4,201 "
13.     "    "    "    "    and sail .....	962 "
14. Average speed under steam alone .....	4.78 knots.
15.     "    "    "    "    and sail.....	5.89 "
16.     "    "    "    sail alone .....	3.19 "
17.     "    "    "    all circumstances.....	4.79 "
18. Mileage per ton under steam alone .....	3.81 miles.
19.     "    "    "    "    and sail .....	5.60 "
20.     "    "    "    "    and steam and sail..	4.15 "
21.     "    "    "    all circumstances.....	4.18 "
22. Coal nominally saved by square sails .....	553 tons.
23. Miles actually lost by square sails.....	530 miles.
24. Gross saving of coal by square sails .....	453 tons.
25. Gross percentage of saving on consumption for engines.....	8.13 per cent.
26. Gross percentage of saving on consumption for all purposes.....	6.72 "

TABLE III.<sup>1</sup>

*Abstract of Tables showing the value of Sail-Power in H.M.S. "Hart," a twin-screw gun vessel. From April 1st, 1874, to June 30th, 1875.*

1. Total distance through the water .....	11,921·8 miles.
2. Distance under steam alone .....	6,588·9 "
3. " " " and sail .....	754·8 "
4. " " " sail alone .....	4,578·8 "
5. Total time under weigh (2,473·5 hours) .....	103 days.
6. Time under steam alone (1,222·5 hours) .....	51 "
7. " " " and sail (165·0 hours) .....	7 "
8. " " " sail alone (1,086·0 hours) .....	45 "
9. Total consumption of coal for all purposes .....	613·6 tons.
10. Consumption of coal for engines .....	496·4 "
11. " " " steaming .....	434·9 "
12. " " " under steam alone .....	390·1 "
13. " " " " steam and sail .....	44·8 "
14. Average speed under steam alone .....	5·3 miles.
15. " " " " and sail .....	4·5 "
16. " " " " sail alone .....	4·2 "
17. " " " " all circumstances .....	4·8 "
18. Mileage per ton under steam alone .....	16·8 "
19. " " " " steam and sail .....	16·8 "
20. " " " " steam and steam and sail ..	16·8 "
21. " " " " all circumstances .....	24·0 "
22. Coal nominally saved by square sails .....	229·0 tons.
23. Miles actually lost by square sails .....	1,109·2 miles.
24. Gross saving of coal by square sails .....	163·6 tons.
25. Gross percentage of saving on consumption for engines .....	32·8 "
26. Gross percentage of saving on consumption for all purposes .....	26·6 "

NOTE.—On the last 5,824 miles, which represent "General Service," the ship burnt 388·4 tons of coal for her engines, and only saved 6·4 tons, or less than 2 per cent., by the use of her sails.

TABLE IV.

*Abstract of Tables showing the Value of Sail-Power in H.M.S. "Egeria," a single-screw sloop, with a lifting screw. From November 2nd, 1874, to June 30th, 1875.*

1. Total distance through the water .....	10,832·0 miles.
2. Distance under steam alone .....	6,708·2 "
3. " " " and sail .....	471·0 "
4. " " " sail alone .....	3,652·8 "
5. Total time under weigh (2,127·5 hours) .....	89 days.
6. Time under steam alone (1,275·5 hours) .....	53½ "
7. " " " and sail (63·5 hours) .....	2½ "
8. " " " sail alone (788·0 hours) .....	33 "
9. Total consumption of coal for all purposes .....	441·3 tons.

<sup>1</sup> Tables III and IV have been added by Captain Colomb, since the paper was read, in order to make it more complete.—ED.



10.	Consumption of coal for engines .....	339·7 tons.
11.	"    "    steaming .....	306·2 "
12.	"    "    under steam alone.....	292·6 "
13.	"    "    "    "    and sail.....	13·6 "
14.	Average speed under steam alone .....	5·2 miles.
15.	"    "    "    and sail.....	7·4 "
16.	"    "    "    sail alone .....	4·6 "
17.	"    "    "    all circumstances.....	5·0 "
18.	Mileage per ton under steam alone .....	22·9 "
19.	"    "    "    steam and sail .....	34·6 "
20.	"    "    "    steam and steam and sail ...	23·4 "
21.	"    "    "    all circumstances .....	31·3 "
22.	Coal nominally saved by square sails .....	124·1 tons.
23.	Miles actually lost by square sails.....	723·5 miles.
24.	Gross saving of coal by square sails .....	111·0 tons.
25.	Gross percentage of saving on consumption for engines.....	32·6 "
26.	Gross percentage of saving on consumption for all purposes.. .....	25·1 "

Admiral Sir SPENCER ROBINSON: I am sure we have all listened with the greatest interest to the very valuable, well written, and well considered paper that Captain Colomb has been so kind to read to us. The calculations that he has entered into, and the figures on which his theory is founded, fully justified what he said just now, that if he was a little rash, there was method and very considerable method in his rashness. I am sure all of us who have the pleasure of knowing that Officer, and who have heard him lecture and discuss subjects in this theatre, must have been perfectly prepared for something extremely valuable and interesting when we knew that he was to come here to-night. For my own part I felt perfectly certain that I should hear something which would be exceedingly instructive, and would powerfully aid either in confirming or disproving certain theories which I myself had held for a considerable period, and had had some power of carrying into practice. Captain Colomb began by observing what I know to be perfectly true, that he was particularly struck by the change that had come over the minds of most Naval Officers during so short a period as four years relative to the utility of sail-power, and to the principles to be adopted in masting our ships. I for a long time, far longer than the time he mentioned, have held very much the theories that Captain Colomb has so ably set forth to-night, and I have long been persuaded that the time was certain to come when that love of our spars and sails, that certainly does belong to every sailor, and from which, as he so justly said, we cannot part without regret, must be dismissed as a thing of the past. Such lectures as we have heard to-night will go further to establish in the minds of all those who reflect, and who are not led away simply by mere verbal expressions, that we may pay very much too dearly for our masts, and we may by the adoption of wrong principles deprive ourselves of the very special and far greater power without which our ships of war are entirely useless—even when we apply only such masts and yards, and make such moderate use of sail-power, as our ironclads are of necessity reduced to. I have no doubt myself, that although not likely for some little time to find favour in the naval world, the theory and principles which Captain Colomb has laid before us will go further than he as yet is willing to go, and having found him come round to the ideas that I held some twelve or fourteen years ago, I am perfectly sure that in process of time he will advance to its full application, to which I will just advert in passing. Captain Colomb stated, that he was not an advocate for absolutely mastless ships, whereas I believe and am confident that, for certain purposes of war, the absolutely mastless ship will prevail over all others. I am certain of this, that the misery and distraction of insufficient coal supply, and the absolute incapacity an Officer often finds himself under to work to the best advantage the powerful engines that are now put into the modern iron-clad, are often owing to this: that these masts prevent the engines, as Captain Colomb has shown us very clearly, from doing the work which they ought to do, and

that in the hour of action and the day of need, far from being enabled to trust to these masts and spars taking us out of action, they will destroy that efficiency of our propeller and of our artillery through which alone we can hope to win the naval battle of the future. Many of the points touched upon by Captain Colomb I can corroborate in a very marked way. During the time I was at the Admiralty we had repeated trials of ships without masts, and trials of the same ships masted. The comparison was remarkable in the sense that he has laid before you to-day; the loss from masting the ship was extraordinary, and the actual loss of speed at the measured mile in many instances amounted to far more than the 5 per cent. that Captain Colomb has stated. The only point connected with the masting of ships, and with the increased displacement consequent thereon, that Captain Colomb adverted to which I do not feel perfectly sure about is this: it is not always the case that lightening the ship, and diminishing the immersed area of midship section, causes the speed of the ship to be increased, or causes the mileage per ton for weight of coal burnt to be increased. In some instances, though by no means in the majority of cases, quite sufficient is known to make one feel the impossibility of agreeing with the theory that every time you lighten the displacement of the ship, you add to her speed and diminish her coal consumption, because there are so many cases in which we find that ships more immersed, that is, with greater load as it were to drive through the water, greater area of midship section, go faster than they did in their light state, and the reason is not far to seek. Owing to Mr. Froude's experiments, and owing to the scientific analysis and investigation of such gentlemen as my friend Mr. Scott Russell, we are much better acquainted than we were with the resistance offered by the water to propulsion, and have seen that the screw working in deeper water has sometimes a greater propelling and a more efficient power notwithstanding the greater load that it has to propel. But though I say that there are many instances, and there appears to be a good reason in many cases for what I now say, that the absolute displacement of a ship will not always be the measure of her speed and coal consumption, and that lightening the ship may not absolutely produce the best result in propelling her, yet the advantages Captain Colomb has put before you of removing the enormous weight of two or three hundred tons of masts, rigging, sails, and stores will, in the majority of cases, be found to exist, and even retaining the same amounts of weight, two or three hundred tons applied either in armour, coals, or armament, would give us advantages of which we are entirely bereft by the application of sail-power. The safety of ironclads has often given us some concern. Doing away with the masts of these ships at once removes all fear as to the comparatively high position of their centre of gravity, which has been often entertained with some little reason for doing so. The load upon all ironclads is necessarily higher, and necessarily raises the centre of gravity more than it is raised in ordinary ships, and if we add to that, sail-power, we may perhaps place our ships, when their angles of inclination are large, in an uncomfortable and dangerous position. By doing away with these masts and yards, we need not hesitate to put our weight exactly where it is most convenient, in order to make a formidable ship for offensive or defensive purposes. I quite follow Captain Colomb's very lucid tables, which explain precisely the data on which he calculated that the square sails of a ship did not afford any saving of coal, inasmuch as the saving of coal was more than counterbalanced in some instances by the reduced speed. There was one case I thought had escaped him, that is of a ship making a long passage with a fair trade wind—a case that will be familiar to all of us yet I think. The description of that vessel that went from Aden to Trincomalee very much met what had occurred to me, and removed, as I thought, an objection which I should have taken to some of the calculations that Captain Colomb brought forward. The fact is this: take, for instance, the flag-ship in the Pacific; she had a passage to make from Valparaiso to Callao. She has during that 1,400 miles run an invariable fresh strong wind, and I thought he had rather overlooked the use of sail in such a case. She would never light her fires, but the use of her sails would take her that journey with a complete and thorough saving of coal. I thought that proved that there might be cases in which the square sails of a ship, baneful as they are to her in various ways, might still in some circumstances prove an actual advantage; but when I heard Captain Colomb's lucid manner of turning those miles into tons of coal, I began to think he

had not overlooked any part of the argument, and as far as I could follow him, his deductions about coal power, the number of miles due to a ton of coal, saving of coal, and loss of speed, were fairly stated. He has not been tempted to overrun his argument by taking only the favourable side of the question, but he gave us in that case of a ship running before a monsoon, precisely the case that had occurred to me of a ship running before the trade wind; and on a review of the whole subject the question is settled entirely, in my opinion, in favour of the non-carrying of square sails—not carrying sails at all I should like to say, but it is too early at present to insist on that—those who come after me will, I believe, advocate that course, but I do not expect to see it adopted in my time. The last thing that I shall revert to is this. I know by the description Captain Colomb has given, that in almost all the cases in which he has been trying the speed of ships under sail, there has been that miserable drag of the screw to contend against. In the case of the ship he himself commanded, I think there were two screws, which had to be dragged after her, and all the sail-power in the world is fruitless and helpless to get anything like the proper speed of a ship from her while dragging her two screws, together with the various contrivances which I think I know pretty well were not perhaps as good in that ship as they might be made; she was constructed in the early days of twin screws, so that she is not a very favourable specimen of what a ship could do under sail. When, for instance, something in the course of the argument as to sail-power *versus* coal, Captain Colomb had to state that under favourable circumstances no more than  $8\frac{1}{2}$  knots could be got under sail out of the ship while dragging the screws; there is no doubt that with those screws raised he could have got  $11\frac{1}{2}$  knots, but the nature of the case which rendered that impossible to do, also made the comparison less favourable than it might prove in ships possessing that power. I am sure I need only say that we have had the greatest possible pleasure in listening to what Captain Colomb has said, and as far as I am able to judge of such matters I concur most heartily in the principles he has urged.

The CHAIRMAN: I think it would be desirable if some Officers present this evening, who have recently commanded ships, will favour us with their views on this subject. I see Captain Tryon present.

Captain TRYON: I had recently the honour of commanding a frigate that would steam 15 knots and sail still faster. The only part of this very able lecture which I shall somewhat venture to criticise relates to the tables which I see before me. The speed is so miserably slow. I see the speed "under sail" is 3·3. If those are the conditions under which sail is set, it is hardly worth counting, considering the great disadvantages attached to carrying those yards and spars with their excessive weights and incumbrances. Looking at Table II there is a gain of coal of somewhere about one-tenth, owing to the use of sails, but there is a column here set down as "miles actually lost through sails"—580 miles. It appears to me just possible that you do not want to go that distance. A man-of-war is not always making passages; she is sent out to cruise; it is necessary for her to retain in her bunkers that amount of coal in order to chase an enemy, therefore I do not think it is quite fair to write off that coal. It appears to me that the question raised to-night is one of the most difficult problems we have to deal with in constructing men-of-war, and I think, so far as young Officers in command at the present day are concerned, that immediately we heard it was time to look around us on service, we nearly all of us asked to get rid of everything above the outer works. We do not like the masts at all; we go as far as Sir Spencer Robinson, and say we want no masts whatever. I think that is the opinion of a very large number of us, that they will be of no assistance whatever to us in action, and that is the time when we have to consider what is best for our ships. On the other hand, there are circumstances on very long cruises, such as Sir Spencer Robinson referred to, where the sails in a frigate, such as that I had the honour to command, are undoubtedly of enormous value. I could go from England and make a very rapid passage, not at these 3 knots, but at a very high speed, right away to the Pacific, and carry the larger portion of my coal in the bunkers. It is perfectly true if I had not had these spars and 20-ton masts the weight would have been put in the ship in the shape of coal; but still that coal would not have taken me that distance, and would not have kept me so long at sea, had I been cruising, and that coal I should have had, could be replaced by floating coal depôts in the shape of



powerful colliers. I think we do want for the great Navy of England, vessels that will have sail as an auxiliary power, to keep them at sea for long cruizes; but for our men-of-war in the Mediterranean and near at home we want nothing beyond flag-staffs higher up than our bulwarks.

Sir SPENCER ROBINSON: I entirely agree with what Captain Tryon said. I meant to confine the remarks I made to ironclads and not to men-of-war generally, such as cruising ships.

Admiral HAMILTON: The few observations I have to make will apply to cruising ships and not to ironclads, and with regard to those I will give a few cases in my own experience. It was my misfortune to get my ship on shore on one occasion at a distance of 600 miles from Havana, the nearest coaling station. We were obliged to throw nearly all the coals overboard to get her off, and then if she had had no sails I do not know where we should have been; we should certainly have been in a mess. On another occasion we got on shore on the Labrador coast, and there we had also to throw the coal over. If we had not had sail-power to fall back upon, we should very probably in that case have landed on an iceberg, or been frozen in for the winter. Of course, if any of us take up a hobby, you know you may prove almost anything from figures, and it is impossible for us to gainsay those figures now before us. Everybody knows the mathematical paradox  $\frac{0}{0} = 1,000$ , or

any number you please; but practically you divide nothing by nothing and it is equal to nothing. Although those figures may apply to the twin screw ironclad which Captain Colomb commanded, I do not at all think they apply to our ordinary cruisers. I myself do not think the day has yet come for the abolition of sails for vessels on foreign stations. I should like to know what our gallant lecturer could have done to put down slavery on the coast of Zanzibar without the use of sails, because we know that boilers and engines of ships do break down occasionally. There are some very important lines of Transatlantic steamers going out of Liverpool, and every one of these liners is sparred and masted to a very fair extent. I have made six passages across the Atlantic in them, and I found they never lose an opportunity of making or shortening sail. In these, the Cunard, the Inman, and the White Star lines, we find more attention paid to making and shortening sail in full power steamers than we do in the Royal Navy. Depend upon it, it is an economic gain to these firms, or they would not keep those sails and make use of them as they do. Not only that, but in going out to the westward in the winter time they never send down the topgallant mast, as they said, "The stick aloft makes "no difference; it is the sea that brings ships up to a great extent, and not the wind." I think there is another point in which the use of sails is still beneficial, and that is when we have to make our sailors or keep the knowledge. We do not want them to be mere drilled machines. In war time the work the seaman has to do develops his individuality, but in peace time, you want masts and spars for the purpose of drilling men in their own line. Before masts and sails can be abolished, we must have a sufficiency of coal stations to meet all wants and exigencies, which we have not at present, and boilers and engines ought never to break down. Scarcely a quarter of a year elapses without our reading accounts of broken-down engines and the vessels returning under canvas.

Admiral RYDER: I have very few observations to make, and I, for the last three years, have sailed in the ship the lecturer has been speaking of, and we have very often talked this matter over. He would like to unrig the "Audacious," or partially unrig her. If her hull had been so designed as to enable her to carry more sail, I should have liked to have seen her more fully rigged. But as she was designed, she could not have been more fully rigged, because she would not have been safe. I have not yet heard from designers of ships that they cannot design a vessel that would be a good ironclad, and suited for foreign cruising. I am not talking of "Devastations" for Channel work; but for vessels to go to the Pacific I believe our designers (Mr. Reed has assured us in his evidence before the Committee of Designs that he can do so) can design a thoroughly useful cruising ironclad—which will also be a full rigged ship—capable of working to windward at least one mile an hour under all plain sail. The "Audacious" as she was rigged (I quite agree with Captain

Colomb), could not do so. I remember his getting her under weigh in an open anchorage, and being unable to have her under sail alone because she was quite unmanageable; but that is not a sufficient proof that an ironclad for distant foreign service cannot have a proper sail equipment if she is so designed as to carry it.<sup>1</sup>

Admiral SELWYN: There is no earthly reason why we should have such failures both in steaming and in sailing, as that vessel brought before us. All the percentages would come out totally different if we had had a decent performance either under sail or steam. I quite join with the writer of the paper in thinking that we might easily substitute fore-and-aft sails of great power, and fore-and-aft masts for the heavy yards we carry now; and if those masts were made of steel, and therefore without the necessity of rigging to support them, if they were made telescopic in shape, so that they could be lowered in the event of your going into action, then I say you would get a perfect sailing ship and a perfect vessel under steam. In the item of steam, I am happy to say, I know perfectly well that this year you will see the power of your coal doubled; but I do not know when you will see steel masts put into ships with proper sails, such as will drive a ship well shaped as she generally is under water, in spite of her screws, at a very fair rate, certainly not less than 10 knots on a wind, and probably from 12 to 13 off the wind. That is a result which you ought to get, which you can get, which there is no earthly reason why you should not get, except a bad disposition of weights on board the ship which makes her liable to capsize if you put sail on her. I join with Admiral Ryder in saying that our naval architects will tell us with one voice, that whatever we ask them for in that way they will give us. Mr. Scott Russell has very often said, "It is for the naval men to tell us what they want, and it is for us to do it." And I am quite sure he and others have sufficient talent to give us a good ironclad capable of steaming not less than 15 knots, and of sailing 10 knots on the wind, and from 12 to 13 knots off the wind. Then I think we shall acknowledge that the sail is worth having, but put before us in this way, the sail is not worth having, it is a doubt whether even the steam is worth having which the vessel did carry. Who on earth since Noah's ark was built, ever thought of going about the sea at four knots an hour? I say it is a ridiculous failure, and in that way we ought to look at it and to be ashamed of it, and to say we can do much better. Does anybody believe the existing mode of putting armour on above the water is likely to be of any great use to us? For what purpose do we raise the weights in a ship until the ship is scarcely able to stand on her legs? Simply to put armour round guns which would be much better under water where the water as armour would be efficient against guns of whatever size, and at all times. I admire very much the accurate observations Captain Colomb has given, and the way he has put his figures together; but I demur entirely to the conclusions he deduces from them. I demur entirely from drawing any such conclusions as Captain Colomb draws, namely, that the ship was a fair representation of a steam or a sailing ship. Turning to the rig that Captain Colomb proposes, I admire very much indeed the idea of fore-and-aft rig; it has been a favourite of mine for many years, but I do not like his taking away the body sail of the ship, and that is what you do if you put three jury masts with fore-and-aft sails into a large ship; you make her incapable of turning or doing anything else under sail. I had a very interesting instance of it in a screw steamer, which I commanded on the coast of Africa. Her speed under sail with screw down—it was always screw down—was  $7\frac{1}{2}$  knots on the wind, and she got to 9 or 10 knots off the wind. The Admiralty allowed me on coming home

<sup>1</sup> I desiderate to the same extent as Captain Colomb a sufficient coal stowage. 6,000 miles in the bunkers at 5 knots is what I should insist on. The "Audacious" had not 2,000; but until our coal depôts are properly distributed and protected, I ask for an *efficient rigged* type of ironclad for distant cruising—say a full rigged "Northampton." A few feet more beam would probably give her the required additional stability, and the additional displacements to carry the additional weight of masts, stores, men, and provisions required, without lessening her stock of coal or her speed under steam. According to Mr. Froude's dictum, the steadiness of platform, the "Audacious'" distinguishing merit, would have, perhaps, to be secured in a full rigged "Northampton" by larger side keels.—A. P. R.

to put a centre mast placed very nearly as that is; but instead of having small sails the sheets of the fore-and-aft sails that I had, came one-third of the distance abaft the next mast aft of it. That ship afterwards, with her screw still down, beat the fastest Symondite brigs on the coast. She would always do her work perfectly well, having a beautiful bottom with very fine lines. There is no doubt whatever that if you give them proper sail every one of our ships will go as fast as the fastest ships that we ever had before. As to the placing of the ballast it is not entirely on account of the masts and yards, but because the initial stability of the ship is too small even without taking into account, &c., the sails, and therefore cement and bricks had to be put in to keep these vessels on their legs. There was the error, and it is an error which I hope will never be repeated again. I am perfectly certain when we get fore-and-aft sails—of which the fore and mainsails shall occupy nearly the entire space up to about 60 feet from the deck between the two masts, which is what they ought to do—you will then return to your ironclads which will wear and stay quite as well as our old ships used to do in spite of the screw and all the other disadvantages. I ask the Naval Architects for a perfect sailing ship and a perfect steamer as an ironclad, and I do not recognize any difficulty in supplying it.

Mr. SCOTT RUSSELL, F.R.S. : I prefer, very much, on these subjects to have the opinion of naval men rather than to intrude the opinion of a ship-builder. You will, perhaps, be horrified to hear that I am a great lover of sails, and I should infinitely prefer making a voyage in a sailing-ship to making a voyage in a steamer. But I am bound to say to you that I can contribute what I said the reader of the paper is very fond of, facts derived from experience in merchant steamers of the substitution of steam-power for sailing-power, which are much more in accord with Captain Colomb's paper than I like them to be. I was asked to build a steam ship for trying the experiment of substituting steam transport entirely for heavy cheap materials, instead of sail transport. I am obliged to confess what I do not like. I am obliged to confess this to you, that for such common purposes as sailing between England and ports of 400, and 500, and 600 miles, in common vulgar trade, we very soon found out that a steam ship, trusting entirely to her steam, and having scarcely any sails, cost far less money per voyage, and earned much more money per annum, than all her additional coal expenses. And the result I can tell you, in a few words, to be this, that on those trades average sailing vessels only made a voyage once a month in the average of the whole year, steam ships made a voyage once a week all the year round. I therefore say, as a conclusion of experience, that, if a ship is going on a voyage on which steady speed is of any value, then on such work as that, steam does answer the calculations which have just been made, and steam is much cheaper than sail. But, at the same time, let me go back to my old prejudices. Captain Colomb does not propose to do away with sails altogether; he proposes to have sails, and to use those sails in such a manner as shall give the greatest advantage with the least inconvenience. Allow me to add my opinion, as a sailing-ship constructor, to Admiral Selwyn's opinion, that it is possible—if you will allow me to say so, it is easy—if you abandon certain existing plans, to build a man-of-war which shall be able to carry a very large quantity of canvas so conveniently, and with so little impediment, that if you will only give up your present modes of carrying that canvas, and will carry it in modes suitable to the new conditions which steam has raised, you can make a vessel carry a good deal more canvas than Captain Colomb has shown in his proposal, but on something like the same principle, with great advantage and with no inconvenience. While, therefore, I am sure that trusting more and more to your steam will be an enormous advantage to the fighting power of your ships; while I think, trusting much to your present system of sails for practical work, when you come to want it, is very likely to prove untrustworthy, and to lead you into difficulty, I would seriously suggest to you, while you improve your steam power to the utmost, not to run away from the sails without making a very great effort indeed to simplify all their arrangements as much as possible, to have as little impediment as possible from the plans that have been taken, and to enable you to utilize them, as a third resource, when necessary. Allow me to make one final remark, which I think is of great consequence to you in the practical use of your steam ships. I do not like twin-screws. I prefer one very much, but I recommend you to have all your steam ships with two screws, and for this reason only: when



one screw is disabled, I like to have another, therefore I recommend you to use what I do not approve, but what I think is entirely for your interest, and entirely consistent with prudence. The other point I would just allude to, for a moment, is this, that I think you may dismiss from your minds all concern about ballast, and things of that kind. I do not think anyone has any right to build a war steam ship that has anything to do with ballast, and I will give you a conclusive reason why you should not. I want the ballast in a useful shape, instead of in a useless shape, and when you have got on board your ship 500 tons of iron, in the shape of machinery and boilers, or perhaps 1,000 or 1,500 tons, what a goose you must be if you cannot put that in the place where it will serve all the purposes wanted for ballast and stability. A man who builds a ship for you, and fails to do that, knows nothing about his business.

Captain COLOMB: I think I have, in the first instance, to congratulate the Institution on the fact that every speaker has stuck to his point, and that the paper put before this Institution has been really discussed. It has been my unfortunate lot occasionally to read papers at this Institution which have not been, by any means, properly discussed. I am sorry to say, sometimes speakers so far forget themselves as not, for one single moment, to allude to the subject of the paper, but to ride—as we are all, of course, liable to do—off on their own little hobbies. I think, for the credit of the Institution, we might all try to keep the discussion as it has been kept to-night, strictly to the point. I have to thank Sir Spencer Robinson, and generally the speakers, for the very flattering way in which they have received the paper. Sir Spencer Robinson, in one way, is further in advance than I am; he would take away the sail-power entirely from a fleet-ship or ironclad; but so far as I understood him, Captain Tryon's old ship, the "Raleigh," more nearly meets his view of a cruising ship than the ideal I have attempted to put before the meeting. So far as the ironclad herself goes, I suspect it may be I have not got quite the pluck to go as far as Sir Spencer Robinson has. I must say I waver very much upon that point. So far as the other point goes, I must say I have taken the figures out as far as I could. The figures referred to have been, in the main, based on the table before you. But, as I reminded you, that table was drawn from twenty-eight primary tables, similar to Table I, which is entirely drawn from the ironclad spoken of; but there are still the remaining number of the forty-five tables, which are drawn in one case from a non-lifting twin-screw sloop, and in the other case from a lifting screw sloop. I quite agree with Sir Spencer Robinson, it is apparent, on the figures furnished from time to time by the Admiralty, that less displacement does not always increase speed; but still I think it may be taken in any ship of the Navy now afloat, the rule will be that, if you take some of her weight out of her, she will go faster. I think the great mass of steam trials of our ships on the measured mile shows, on an average, that they have run better at their light than their deep draught. But, of course, Sir Spencer Robinson's question is entirely bounded by the immersion of the screws, not actually by the displacement of the ship, and you might get immersion of the screws by great draught at the stern, without increasing the immersed area of midship section. Sir Spencer Robinson also spoke of the Pacific. Now, the Pacific is a trouble to me; it always has been a trouble. I own I do not quite see how to manage it at present, but when I come to think of the fact—which I believe, as far as I can make out, is quite certain—that, with the twin-screw under anything like decent sail-power, such as we could give her, say two feet per ton of displacement—with one of the screws only going, pretty close to wind, and moderate sail-power of this kind, you immediately double your mileage per ton, and, I think, in the Pacific the twin-screw, with fair coal supply and a fair amount of sail-power, would make those long passages more easily and quickly than with the present coal stowage and full rig. Sir Spencer spoke of the drag of the screw. I was bound to go to some ship which had not the drag of the screw, and I went to a ship with a lifting screw. Some twelve or fourteen tables, covering 10,000 miles, are taken from a ship which lifted her screw. It is quite certain your greatest gain with your sail-power is when you lift your screw and get the ship under sail alone. When you can do that, you get an enormous gain, and if you could have shown that there are figures extant to prove my figures here are overthrown by such a ship, then I must admit the fact. But in the ship I have examined, although she gained

by lifting her screw, she does not gain sufficiently to overstep the figures. She shows some 25 per cent. of gain. The Officer commanding her, although exceedingly fond of his sails, assured me that, if I had pursued my inquiries further, her percentage would have continually dropped, because she happened to go to places where her sail-power was not so available. Captain Tryon spoke of the slow speed. Well, I am as much against slow speed as he can be; but examining, as I have done, a great many of our ships, the slow speed is an absolute necessity for us. As we stand with our present coal consumption and stowage, the slow speed, when we want to get from point to point, is a thing which we cannot get over, and I think there is one point which we always forget. I tried to bring it forward in my essay; that is, that we start from certain fixed geographical facts. Except in the Pacific, it is a fact that there are no two coaling stations on British territory that are further apart than 3,300 miles. I think that is a thing that lies at the base of the whole of our shipbuilding policy. We have to recollect, if we have 3,300 miles of coal in our bunkers, we can always go from point to point with the certainty of a coal supply, provided we take care to keep the coal up. Admiral Hamilton was a little against me. I know quite well that, in reading a paper of this kind, I am in one sense throwing an apple of discord into the Navy. I hope it is a good apple of discord, and that we shall have many discussions, over it—and no doubt a great many fights—because out of these fights and discussions, truth comes forward at last. He spoke of the difficulty in which he would have found himself had he been deprived of his sail-power. Well, now you know I could not meet his remarks or answer them unless I had the facts relating to his ship. If I had the tables, such as I have there, of the whole of her commission, I should probably be able to answer the whole of his observations.

Admiral HAMILTON: I was alluding to the special case of being ashore, and having to throw the coal overboard.<sup>1</sup>

Captain COLOMB: That is quite fair; but still I could not answer your question unless I had the whole of the facts of the ship before me, which I have not. The difficulty is this. We are at present, in spite of ourselves, sending ships to sea, and the most valuable ships in the service, in the condition in which you would have found yourself under my proposals. If the "Devastation" goes on shore to-morrow, where is she? And of course every other nation is doing the same thing. There are several ships in the Mediterranean without sail-power.

Admiral HAMILTON: I was referring to cruising vessels: I give up the ironclads to a certain extent, not altogether.

Captain COLOMB: I think Admiral Hamilton drew attention to a previous command of mine, and asked how I should have got on without sail in her. When I commanded a previous ship, which was more capable of acting under sail than my last command, I certainly was not prepared to go as far as I now do; but at the same time doubts used to raise themselves in my mind. The ship I commanded, in order to establish her sail-power, had great draught of water. She was exceedingly lightly armed, and she gave up her armament and her draught of water, for the purpose of carrying her sails. A very much smaller ship would have carried the same armament on a very much less draught of water, and would, with a little increased coal supply, have done all the work we had to do. If there is a break-down of boilers and engines, of course there we are. That is the point. Every person who considers this question is bound to raise and think it out: and the way I have thought it out for myself is this: we have had steam and sail fighting a battle in our ships for thirty years. It is a battle in which steam has been constantly winning, and sails constantly losing. In all those thirty years, who can produce half-a-dozen cases where the sail-power really took the ship out of a danger or brought her safe home when the boilers and engines broke down? There are such cases no doubt, but on the other hand you get cases exactly the opposite way. The "Thetis" the other day—a full-rigged ship—got away from Port Saïd, jammed her screw, broke down in her engines, and you had the whole country in alarm about this full-rigged sailing ship.

<sup>1</sup> My debating powers were not quick enough to give the true answer to Admiral Hamilton, which is this: if he had had less masts and sails, he would have kept coal on board equivalent to the weight gained.—P. H. C.



They sent the "Devastation" out to pick her up, and she had to be brought in to Malta by a steam-ship without sail-power. A sister vessel to my former command stood across from Zanzibar to the coast of India and burnt the whole of her coal. She touched at a little port, the only one she could fetch in the south of India, and telegraphed up to the Commodore to say they were starving, their coal was out, their rum was out, their biscuit was out, everything was out. I received orders to go down and take this fully rigged sailing vessel in tow, and bring her to Bombay. I found her in a starving condition, and towed them the 300 miles to Bombay. If that ship had had a large coal supply I should not have had to go after her. The area of sail in mail steamers is another point which must occur to anybody putting forward a thesis such as I have put forward. I have made a good many inquiries about it. Coming home in a Peninsular and Oriental steamer the other day with some of the most intelligent men I have met, I had very long conversations with them. They told me the Peninsular and Oriental Company were quite at their wits' end as to whether sail is good or bad; that they make sail because they are bound to, but they do not in the least know whether it does them good or harm, and nobody ever made any calculations to ascertain which. It may be that they are good, but the facts nil, we have not got them. Admiral Ryder said he would like to have had some more rig in the "Audacious."

Admiral RYDER: Not in the "Audacious."

Captain COLOMB: In a particular ship which might be designed, and of course this brings out the whole question of stability. The ship in question had four square feet per ton displacement. You might, of course, by reducing your centre of effort, have got more sail upon her; but that is one of the questions in point. Admiral Selwyn has also made some observations. I think I should not have gone quite so far as he did as to speak of the ironclad in question, or her class, or in fact any of our ironclads, as "failures." I think it is a pity that strong expressions should be used. I think we should recognise the fact that we are in the midst of immense changes, and that not one of us knows whither they are leading us, and what is to become of us all. With compound engines, if Admiral Selwyn will produce us a ship which will steam thoroughly well and go 10 knots on the bowline, and 12 to 13 knots under sail, I am perfectly certain we should recognise her as a very perfect ship, provided she was not capable of being met at sea by a ship of the same displacement with heavier armament which would beat her. Admiral Selwyn also spoke of "Noah's arks." I am not prepared to admit that any of our ships are "Noah's arks." I think, having gone as an amateur into the figures, and made a very rash attempt at inquiring into the conditions of our ships, the conclusion I arrived at is very far from that of the gallant Admiral. They are, as a rule, the class of ship which every naval architect in Europe copies.

Admiral SELWYN: I spoke simply of the speed—the speed of a Noah's ark.

Captain COLOMB: The speed is practically the same. If you have to do the same work, the whole of the navies of Europe are in precisely the same condition, and I am not prepared to say that human brains are able to go further than they have shown themselves capable of doing in the designs of our ironclads at the present time. Admiral Selwyn also brought up the whole question of stability and rolling. A great many people think that I am one of those who imagine that this rise in the centre of gravity which has taken place at present, is a thing which I deprecate. The question before the naval architect is this: "I want a "steady gun platform," says the Naval Officer. Says the architect, "I cannot "at present give you that, unless I bring your centre of gravity up—unless I make "your initial stability small. I do not make your *stability* small, because the arm "of my lever extends very rapidly as the ship heels over, but I cannot give you a "steady gun platform unless I make my initial stability small." The only question is how small may he make that with safety. When you find fault with ballasting this ship you must recollect she was in some degree an experiment, and all you can say when you have said all that can be said, is that "they cut it a little too fine;" but the gallant Officer is, I think, wrong in supposing the ship would be unstable without ballast if the masts were taken out of her. I must quote one or two figures to show how mistaken those are who speak as Admiral Selwyn has done. "Fore and main yards weigh, in round numbers, 9 tons, and are 70 feet above the



“ present centre of gravity. Their moment is thus 630 foot tons. The topsail yards weigh 3 tons, and when hoisted are 122 feet above the centre of gravity. Their joint moment is thus 366 foot tons, or for both lower and topsail yards 996 foot tons.” This is the equivalent of 50 tons of ballast.

Admiral SELWYN : You are talking of dynamics ; I call them statics.

Captain COLOMB : There is the whole point. Mr. Scott Russell was kind enough to agree with me on general points. He objects to the twin-screw for certain reasons, but upon the whole he thinks its merits for other sufficient reasons outweigh its demerits. I can only say, in conclusion, I am very much obliged to the meeting for the kind way in which they have received my paper.

The CHAIRMAN : At this hour I need not detain the meeting by any words of my own. I think we have to thank Captain Colomb for the great pains he has taken, not only in the lecture he has put before us, but also in his reply, which really almost comes to a second lecture. I therefore offer him on the part of the meeting our double thanks. It must have been an extremely interesting evening, especially to Naval Officers, and I hope we shall have many such discussions.

## Evening Meeting.

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Monday, February 11th, 1878.

LIEUTENANT-GENERAL SIR GARNET J. WOLSELEY, K.C.B.,  
G.C.M.G., &c., &c., in the Chair.

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### ON THE BEST DETAIL FORMATIONS FOR INFANTRY ATTACK.

By Lieut.-Colonel J. H. A. MACDONALD, Queen's City of Edinburgh  
Rifle Volunteer Brigade.

HAVING been more than once urged by military men, well versed in their profession, to prepare a paper for this Institution, which might be the means of evoking discussion on infantry tactics, in the present transition state of that branch of military science, I have undertaken to do so with some misgiving, for I cannot but feel that one who knows nothing of active military service, must appear as Fitz-James did to Roderick Dhu, a mere carpet knight, to those who have seen the tactics taught on parade, practically tested in the field. But I am encouraged by the kind and generous reception accorded to me by the profession, when I ventured before to write on a military subject, to hope that those friends who bade me come before you may not fall under your censure.

Modern weapons have made change in tactics an absolute necessity. While it was possible to come to close quarters, before either belligerent could inflict serious loss upon the other, close formations were permissible, and roundabout modes of movement might not be fraught with much danger. Large bodies could be moved directly by the word of command of one Officer, the mode in which the order was to be obeyed being inflexible, and the subordinate Officers having no other responsibility than that of seeing the command carried out with an exactitude as nearly mathematical as possible. On an order being given, the consequent words of command by the subordinate Officers were fixed and unvarying. The change to be effected was so precise, and the mode of carrying it out so strictly confined to movements in exact lines, and wheels on pivots, that its detail could be laid down absolutely on a

diagram. The battalion was thus practically the smallest tactical unit, falling into wings or divisions only in order to facilitate transition from one position to another, reconsolidation in one compact body in a new position, whether in line or column, being the immediate purpose of every movement. When the battalion was divided, the segments were jealously kept in one order, so that, on reconsolidation, the sequence of its parts should be exactly the same as before. From the moment of its formation on parade, it had a front nailed on to one side of it, by Her Majesty's orders, so that its commander was the slave of that front, and could not handle his battalion as he pleased, to suit the position in which he found himself. A regiment which happened to leave its private parade in what was called "right in front" might be able at once to take up its position in brigade, while another, arriving in what was called "left in front," might be unable to take its place till it had been put through a manœuvre as lengthy as and more complicated than a figure of a quadrille. In short, rigidity, as contradistinguished from flexibility, was the most marked characteristic of infantry tactics. And this, not only in our own country, but throughout the whole continent of Europe.

But within the last ten or twelve years, a great many of these features of complication and rigidity have been removed from the Field Exercise. The system of artificial fronts was most vigorously attacked, not only by amateurs like myself, but by professional soldiers, notably by one who has done much service in the field, Colonel Sir Lumley Graham, late of the 18th Royal Irish, whose denunciation of them as "arbitrary" is most just and pithy. And the result is, that now the parts of a battalion are moved so as to bring it as quickly and efficiently as possible into new positions, without regard to what company may come to stand in front, rear, right, or left. The Commanding Officer has no longer a double duty to perform, one, to bring his battalion into a position ordered, and the other, to keep his companies always in a fixed sequence. Time is not wasted in elaborate wheels, and a general tendency is evinced to go the shortest way from point to point. It may give some idea of the extent of change that has taken place in military opinion, to quote one passage from the Field Exercise and Evolutions of Infantry for the year 1833, viz., "*The formation of 'four-deep, though deemed inapplicable to battalion drill with reference to service, may, nevertheless, in certain cases, be applied,' &c.*" How strangely this reads in the light of the changes made since that time. It may now safely be said that, although some movements are still retained which are performed by wheels, these are never made use of on service. When troops are out manœuvring, on a large scale, on ground not as flat as a barrack-yard, as on Salisbury Plain or Dartmoor, the convenient formation of fours is that which commends itself to everyone as the most applicable in almost all circumstances. Troops can be moved round obstacles, or led through gaps in fences, and the new formation be more rapidly reached, and as steadily completed, as under the old system.

But now that all this has been done, a new difficulty has arisen. The formations themselves are being found to require modification.



The column has lost its place in attack for ever, as no troops can live in it, under modern fire. And, although a line formation is still, and wisely, looked upon as the most efficient mode of finally forcing an enemy's position, it is on all hands admitted that troops cannot traverse in any solid formation whatever, the many hundreds of yards beyond the range of close quarters now covered by even small-arm fire. Means must, therefore, be found for pushing forward, bit by bit, the force which it is ultimately intended to concentrate in a line for the final effort, so as to enable the consolidation to be made without such losses beforehand as would practically shatter the force, reducing it to the condition of a weapon liable to break from sheer weakness in the attempt to make it strike with crushing effect. This is the practical problem to be solved in infantry tactics. If I may use homely language, I would describe it thus: How best to dribble in detail over the ground covered by long-range fire so as to retain sufficient strength and connectedness to be able to tighten together effectively, for the final blow which shall decide the day.

It can scarcely be said that any nation has as yet satisfactorily worked out a mode of detail for effecting this object; but there is more than one that has adopted a tentative system, and is elaborating it from day to day. It may suffice to refer to the Prussian and our own as illustrations of some of the principles aimed at, and the modes by which it is attempted to follow these out.

The Prussians have adopted as a fundamental principle that when the force which is to be pushed forward by sending a part out first, pressing forward other parts as may be required to solidify it and concentrate attack at close quarters, the process should be so regulated as to restore each unit to its integrity, and not mix the units together. And having adopted the company as the "sub-unit for battle," they work it in a company column, sending out a part of and then the whole of the first section, treating the next section as a support and the remainder as a reserve, all under the direct control of the company Officer, who can order up reinforcements as he sees fit. So strictly do they adhere to the principle of endeavouring to secure tactical restoration of the unit in its perfect form, that it is laid down in their system that the sections of the company forming its supports or reserve shall not, when brought up to the fighting line, be interspersed between the extended files already in front, but shall fill up intervals left, those already in front closing in to make room for them.

Our system is quite the opposite of this. The tactical unit is kept large, and support is not in the discretion of the company Officer. He must trust to his need of it being seen by another, and must hold out as he best can till it is sent to him. Whole companies are moved to the front at once, and concentration is obtained by extending and advancing other companies, their files getting in between those of the company in front. Orders for reinforcement are never given by the Officer in command of the company who is in the fighting line, but always by a field Officer. The result is that the whole line is reinforced at every point, but the companies are mixed up together indiscriminately. Thus the very thing which the Prussians so anxiously guard against

is a leading feature of our system. They sacrifice the advantages of reinforcement and a fresh supply of ammunition at every point of their fighting line in order to obtain tactical reconstruction; we obtain complete reinforcement at the expense of a total abandonment of consistency of tactical form. It is therefore plain that where the modes adopted for attack by two nations differ so fundamentally, there must be something that is faulty in one at least of them, and possibly that both may be open to serious objection. I am inclined to think that a critical examination for the purpose of arriving at a decision as to the things to be aimed at in framing infantry tactics to suit modern fire range, will demonstrate that in both the systems referred to faulty modes have been adopted for carrying out sound principles.

The first proposition I would lay down is, that *as the force which formerly went forward compactly must now be broken up into parts and again solidified, a mode should be devised, if that be possible, which shall make reconsolidation be the same thing as reconstruction.* That is to say, given a force that must disintegrate into thinner parts, and re-form a line again after ground has been crossed by the attenuated portions, a mode which would reproduce it as nearly as possible in the tactical form it held at first, would be preferable to a mode which merely formed a similar line, but in which the individual soldiers belonging to different units of command were interspersed together. I think no one can doubt that just as both horse and rider do best when they understand one another's ways, so Officers and men who know each other well are more to be relied on to do their work efficiently than when commander and men have little knowledge of one another. And it follows from this, as a necessary axiom, that the immediate command over men should be changed as little as possible during the course of an engagement. Casualties will occur, but this only removes the command from one known Officer to another, whereas the intermingling of companies necessitates command being transferred to comparatively strange hands, according to the accidents of seniority. This is not only objectionable as being a change, but may often result in men being ignorant at the most critical point of an engagement from whom their orders are to come, than which nothing can be imagined more likely to cause wavering or to convert check into disaster.

The next proposition, being an amplification of the first, is, that *the mode adopted for making reconsolidation spontaneously produce tactical reconstruction should, if possible, effect that result not only when reconsolidation is caused by the main body pushing forward to concentrate the attack, but also, and much more, when reconsolidation results from part of the force first sent forward being ordered or compelled to fall back towards the main body.* I speak subject to correction, but with some confidence, when I say that this is perhaps the most important point of view from which those on the outlook for a good mode of attack should make their observations. If a system can be devised which, from its nature, tends to prevent check from becoming disaster, a temporary disaster from becoming a rout, that system will be preferable to one formed on the assumption that as checks and disasters are

to be avoided, their possibility should be ignored. Tactics which are framed only for victory, and with no regard to preventing repulse from becoming destruction, are essentially faulty. Therefore if the first proposition—that reconsolidation should, as far as possible, be reconstruction of tactical units in pushing forward to success—is sound, it is manifest that the same rule must be in a higher degree applicable to the case of troops compelled to retire. If in falling back they were returning to their places in the tactical unit from which they had been pushed out, rallying and recovery would be made more likely, or if this were not possible, an orderly and on that account less hasty and disastrous retreat might reasonably be hoped for. It is in this particular that there appears to be most faultiness in both our own system and the Prussian. Under our mode of attack, a check and retrograde movement may mean the retirement of several units, mixed up in complete disorder, uncertain who is their commander, and with no tactical form, and therefore no integral cohesion. This is in itself demoralising. A state of things in which it is possible after ground has been lost, that each of two tactical units which were mixed up together, may be able to blame the other for giving way first, without the possibility of the superior Officer ascertaining whether one or the other, or both, were in fault, ought surely to be avoided if possible. But, apart from this, is it not plain that every unnecessary and avoidable disarrangement of units in an advance will have its counterpart in unnecessary but unavoidable disorganization in retreat, if retreat does take place, whether through fault or of necessity? The Prussian system, on the other hand, is based on the idea of reconsolidation taking place by the sections in the fighting line and the other sections being brought end to end, the original attenuated fighting line closing to make room for the parts by which it is to be consolidated, and these, to use the words of their own book, being pushed into the intervals. It is difficult to believe that this mode could ever work satisfactorily, particularly in retreat, and some of their own best authorities condemn it as impracticable. Major-General Newdigate, in his paper on the Prussian drill of 1876, quotes a paragraph which, as he says, indicates the weak point of the new dispersed order of fighting, as adopted by the Prussians, to be the risk of retiring movements degenerating into confusion. The paragraph is as follows:

“It must be rigidly enforced that retiring movements immediately “after an attack are always carried out in step (not at the double), “and that on these occasions taut hold of the men is never lost.”

This just means that a dread lest under this system retirement should not result in reconsolidation and accumulation of power, but should lead to confusion and disaster, compels them to expose men forced to retire to more loss from the enemy's fire than they were liable to when advancing. As General Newdigate truly says, “This “short paragraph speaks with an eloquence which cannot be over- “rated; for it touches the weak point in the dispersed order of fight- “ing,” by which I take him to mean that in the systems adopted up to the present time, it is felt that the retreat is worse provided for from a tactical point of view than the advance, whereas, if it were



possible, the very opposite should be the case. There are no circumstances in which tactical cohesion and concentration are so vital as when a fighting line is being pressed back, and it is demonstrable that they are not the natural sequence of retirement of the fighting line, either on the Prussian system or on our own. The weakest point is found where weakness is most to be guarded against. Of course I am not to be understood as suggesting that any system that could be devised would make it unnecessary to use means to prevent hurry, and to keep taut hold of the men in retiring movements. All I am endeavouring to establish is that it is true that in retiring there is the greatest risk of men getting out of hand, and into a state of unsteadiness, which may become irremediable. This is in itself one of the most cogent reasons for endeavouring to obtain a system, the nature of which shall be such as spontaneously to produce a refitting together of the tactical unit, part of which has been sent forward to engage the enemy, when that part is made to fall back, either because of orders issued by an Officer in superior command for special reasons, or in consequence of the advanced position being for the time untenable.

The last general proposition is, *that the captain of a company being in immediate charge of the men in the fighting line, should have no greater extent of front than will admit of personal superintendence and close control over the men and that those who form the supporting body behind him should be at his command as he may require their assistance.*

The two points of this proposition involve a complete departure from our system, in which a whole company is dispersed in front, and the supporting body is moved by order from behind, issued by an Officer who has several companies to look after. The Prussians, on the other hand, strongly insist on both parts of the proposition as fundamental rules. With them the company is the unit for battle, the company commander having a certain amount of independence of action, and it is specially laid down that "the skirmishers are always supported by the companies to which they belong."

This proposition is insisted on for the following reasons:—

1st. A whole company extended, particularly in the present day, when broken ground and cover are sought for, is likely often to get out of hand. I appeal on this matter to the experience of those who saw the autumn manœuvres on Salisbury Plain, a country selected as being the most open and free from obstructions in England. How often, from the units in the front being too much spread out, did confusion and uncertainty result, corps losing their cohesion and getting helplessly mixed up with others.

2nd. The attempt of a captain to look efficiently after so long a front in broken ground would soon cause bodily exhaustion, weakening his efficiency in every respect. I believe this was the experience of the Kaffir War, where captains suffered terribly from over-exertion in the endeavour to look after their men, often being unable to do it at all.

3rd. Temporary support can be most efficiently used in circumstances which do not call for a reinforcement of the whole line. For example, a small part of the line having to advance down an exposed slope, might be efficiently helped by its own support being pushed up

to the back of the slope, and firing over it. Many other illustrations may at once occur to the mind when our own undulating country with its belts of trees, brushwood, dells, and strong hedgerows are called to mind.

4th. A temporary difficulty occurring at one point of the line can be more quickly and efficiently dealt with. This is too clear to require illustration, except to say in one word that to leave the supply of support entirely in the hands of a mounted Officer, who often may have to go a long distance round about to get forward at all, and who very often cannot by possibility have half his command within sight, appears to be out of the question, now that skirmishing is no longer a mere preliminary to battle, but is an integral part of the main battle itself.

5th. The moral effect of those immediately behind the men in the fighting line being part of the same unit with themselves, their daily companions in duty, and ready to come to their help at the order of their own Officer, would be most beneficial, both in filling the attack with vigour, and preventing a check leading to demoralization. There is an *esprit* of the company, as valuable in its degree as *esprit de corps*, which the new mode of fighting in dispersed order makes it most desirable to foster. If the company is to be a practical tactical unit, then it should be, to use a common phrase, as self-supporting a body as possible.

The points which have now been stated, in such detail as the time at my disposal permits of, as being important to be aimed at in framing a system of infantry tactics, may be summarised thus:—

Consolidation from dispersed order, whether in advancing or retiring movements, to be so effected as to tend to produce tactical reconstruction of units.

The company commander to have his portion of the fighting line so limited as to admit of direct personal superintendence even on broken ground.

The supports and main body in rear of the fighting line to be of the same tactical unit (that is of the same company) as the portion of the fighting line in front of them; the support to be primarily at the disposal of the company commander, as he may require assistance during the advance. The force has thus for its detail work a unity of command in depth from front to rear, without infringing upon the unity of superior command both in length and depth.

Now, in searching for a suitable mode of carrying out these principles, it seems natural to turn back from the subject of advance to attack, and to direct attention to the ordinary parade and marching movements which are used to bring troops into position for active duty. Because it is evident that, if a mode of arrangement already known to be suitable for these purposes, should also be found to supply the means of carrying out the attack in accordance with the principles laid down, a great advantage will be gained, as your system of tactics will be consistent with itself. The advance to attack need not be a departure from, but only a spreading out of, the normal formation; and the bringing up of a main body for the final effort will be but a recontraction into the solidity of the original in its

actual form—not a thing made up like it, but really composed of fragments whose relation to one another is new, accidental, and confused.

Turning, then, back to parade formations, the first that strikes one as being the most convenient for all general purposes, is that of four-deep. It is this formation which is found most suitable for practical work, whenever the level parade has to be left for ordinary ground. It embraces the three elements of simplicity, celerity, and convenience. It is the formation which best fulfils Sir Lumley Graham's desideratum, "total absence of constraint in the position of the soldier, both when halted and on the march, so that he may be able to use his arms and legs to the best advantage;" to which I would add, and in which he can move with least fatigue—all most important matters, when it is considered that fretting trifles tending to physical exhaustion may not only end in destroying bodily activity, but also may seriously affect *morale* in subordinates, mental activity in superiors, and may I not add, temper in all?

Fours being, then, the best general formation for all ordinary purposes, it is obvious that if infantry can be sent out to attack from that formation in such a manner as to fulfil the requirements which have been already insisted on, the whole system of infantry tactics will be simplified and made to have one formation for its basis. It shall now be my endeavour to show that this can be done, and done with advantage in every respect.

Let it be supposed that a line is standing on parade, not in two ranks, dressing by touch, but as it would be under the present system after the order "Fours-deep" had been given; that is to say, it would be standing in four ranks, with about arm's length intervals between the men. As regards ordinary movements, the whole would retain the same formation whether they were moved forward or back, right or left, having merely to turn in the direction ordered. Every man would be perfectly free from constraint in his movements, able to swing his arm, as the Prussians most properly make him do, and would have free circulation of air round him, in whatever direction he moved, small obstructions could be passed without throwing the line out, all counter-marching, all forming to front or rear, to the right and right-about, or left and left-about, would be rendered unnecessary, and there would be no difference as there is now in the mode of formation of fours, whether deep, right, left, or about. The front of a column could be reduced to one-half without any change of formation: column wheels would be much easier, and squares could be formed either four deep or two deep without a different division of the companies. The battalion would be in every way more flexible without there being any tendency to relaxation of strict drill, which is so essential to maintain steadiness and discipline. In a word, the system would be less cumbrous and more what tactics devised for actual use ought to be, as distinguished from tactics which are framed as if troops always moved on ground artificially levelled. To use the words of Major von Scherff, a distinguished German writer on tactics, we can "dispense with a number of close

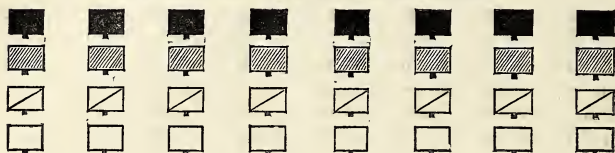


"order formations, which are still much used, and which waste a great deal of time."

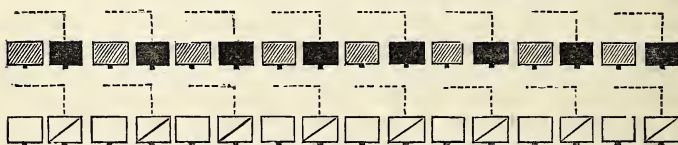
By this arrangement, the fours, if required for a temporary purpose to form two deep, could do so indifferently as to front, without the

FIG. 1.

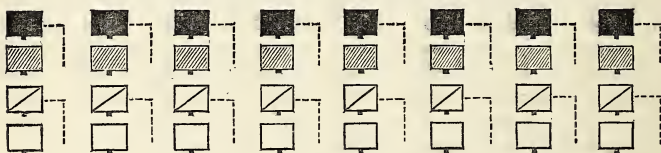
### 32 MEN IN FOURS-DEEP



### AFTER FORMING TWO-DEEP



### REFORMED INTO FOURS-DEEP



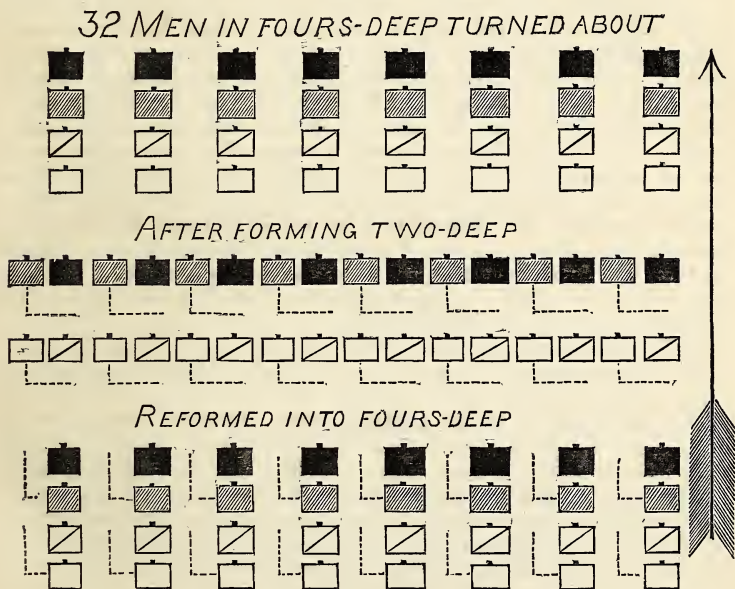
slightest risk of mistake, by following one simple formula, viz: to form two deep the second and fourth men of each four would step to the left and up, and to get back into four deep, the man on the left would step back and to the right. And as the men of each group of four would be convertible units of that group, no confusion could arise. The accompanying diagram shows that the men will, by following this one simple formula, stand always in the same position to one another, whichever way they are turned. Fig. 1 represents the men facing the reader, figure 2 represents them turned about.

It only remains then to examine whether this formation, which recommends itself by its capacity for husbanding physical energy, promoting rapidity of movement, and increasing flexibility in changes of position, can be usefully applied to carry out the principles necessary to be observed in actual engagement with the enemy.

For this purpose it will be most convenient to take a single battalion for illustration. After detailing off from the battalion whatever proportion is necessary for a general reserve, let it be supposed that it

is drawn up in line, in "fours-deep." The best shooting men might be brought to the front, and any men brought into the company in equalising kept in rear. On the order to advance for attack being given, the first rank of fours would be marched off, the captain of each company going with it. In a company of 100 men, each captain would have twenty-five men out in front at one pace interval. Marksmen might be thrown out in front from this rank when ad-

FIG. 2.



visable. The next rank of fours would follow as support, under subaltern officers, two or more intelligent non-commissioned officers going out as links in front, to guide the support correctly in rear of its own part of the fighting line, and to convey any orders from the captains which might be sent back to them. The remaining two ranks of fours forming the main body would follow, their connectedness with the support being kept up in a similar manner.

The units of frontage being moderate in size could thus be most efficiently handled, confusion and loss of connectedness prevented, support brought up for any temporary purpose for which it might be required, a thing of great importance, and specially in a much enclosed country like ours. The whole line could be kept firm hold of, the fire carefully controlled, injudicious and hasty advance restrained, and wavering or giving way checked. Every movement, whether of pushing forward reinforcement, or falling back on support, would tend to

reproduce in its regular form the tactical unit originally subdivided for the attack. The main body would fulfil von Scherff's requirement, as to which every one will agree with him that "in order to give the "necessary impetus to the attack, it will be undoubtedly advisable "that our main body should at least equal in strength the total of the "two front lines." The arrangement will get rid of what he admits to be an evil, but sees no remedy for, the doubling up of section with section and company with company in a confused mass. Each company would, as such, remain under the same direct command from first to last, and the attack when concentrated by the bringing up of the main body, would be not only in form, but in actual fact, an attack of the line, precisely similar to that in use before the days of rifled breech-loaders. This system has moreover two special advantages. The one is that while it is thoroughly well adapted for use in open ground, it is also admirably suited for the very broken and intersected ground we have in this country, and would prevent the great confusion and loss of connectedness that so often resulted from this cause at our Autumn Manceuvres on ground much more open than is generally to be found in England. The other is of an importance that cannot be overrated, viz., that the mode of procedure is the same in every respect, whether the number of men to be moved is small or great. It is as applicable to a squad or company as to a battalion or a brigade, the procedure in all cases being the same.

Such are the main grounds on which it has appeared to me, and to others whose opinions, being those of men of professional experience, have intrinsic value, that the adoption of the four-deep formation as a tactical basis would be an advisable step. It would conduce to the attainment of the three great desiderata—simplicity, celerity, and convenience—while at the same time it would assist the maintenance of disciplined and regulated movement, and husband strength to a greater extent than any other system yet proposed, giving the best hope of physical power being maintained to the decisive moment, and thus indirectly, yet most really, securing the best chance to both Officer and men of being able to work with full vigour and rapid action of the intelligence without which much of the value of bodily energy and skilled training is necessarily lost. And last, but not least, it would make the dominant principle of advance and retirement the same, reconstruction being the natural sequence of either, thus preventing confusion of units in the order-obeying part of the force, and confusion of command in the order-conveying. These are advantages which might outweigh defects in other respects, but if they are found applicable to a system that is in itself unobjectionable, must necessarily turn the scale completely in its favour. Whether they are applicable or not, is a question which I leave with confidence in the hands of those whose professional skill enables them to give their opinion with authority.

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#### APPENDIX.

As a guide to any Officer who will do me the favour to give the system a practical



trial, the general details necessary for the drill of a battalion or brigade are added.<sup>1</sup> I hope that whoever superintends the practice of this drill will keep constantly present to his mind the purpose it is intended to effect.

Troops when required to advance in order of attack have nothing whatever to do with scouting or searching for an enemy, protecting their own flank, or outflanking, or threatening to outflank him. Before an attack of the kind, for which I have endeavoured to suggest a suitable method, is commenced, it is to be understood not only that the position occupied by the enemy is known, but that the troops defending it have, for a considerable time, been exposed to a heavy fire of artillery, and possibly that attempt has already been made to carry the position by the advance of infantry. It is also to be understood that besides the troops to be employed in the direct attack, a separate body has been told off for the protection of flanks, or for operating against the flank of the enemy. Thus, the duty of the Officer in command of the troops told off for the direct attack is restricted to effect a single operation, that of advancing the troops under his command as rapidly as possible directly to their front, over from 2,000 to 1,000 yards of ground exposed to the enemy's fire, with the least possible loss, and the greatest possible power of finally concentrating for the charge, a line of soldiers formed in close file. Let it be supposed that the troops have been deployed in a four deep line and told off in groups of eight, which may be done by telling off the groups of four into "first, second"—"first, second."

At the caution of the General Officer in command "THE LINE WILL ADVANCE IN ORDER OF ATTACK," followed by signal to move, the Commanders of battalions will give the word "*No. 1 ranks—quick march!*" At this word these ranks will step off together in quick time, the "second" of each group of eight inclining to the right so as to come close alongside their "first."<sup>2</sup> When these men have gained from 150 to 200 paces, battalion Commanders will give the word "*No. 2 ranks—quick march!*" when it will move off in the same manner.

No. 3 and 4 ranks, whenever the nature of the ground makes it advisable for the main body to move, will receive the command from the senior Major "*No. 3 and 4 ranks—quick march!*"

In advancing in this formation No. 1 rank will be led by the Captain, assisted by the junior subaltern and two sergeants; No. 2 rank by the senior subaltern, assisted by two sergeants; and No. 3 and 4 ranks by the second senior subalterns and remaining sergeants or lance-sergeants.

The post of the Officers and non-commissioned officers of No. 1 rank will be in rear. The leaders of No. 2 and of No. 3 and 4 ranks will be in front, and the non-commissioned officers attached to these ranks will be in rear of the flanks.

The Captain will be attended by two corporals, who will be used as connecting links to communicate with the supporting ranks and main body.

The post of the Lieutenant-Colonel will be 30 paces in rear of the centre of the line of supporting ranks. He will be accompanied by the junior Major, the Adjutant, and three corporals.<sup>3</sup> The junior Major and Adjutant will act as *aides* in communicating with the leading ranks, and in passing orders along the fighting line and line of supports. The corporals will act as links to communicate with the reserve ranks No. 3 and 4. The post of the senior Major will be 20 paces in front of the line of the reserve ranks (3 and 4). He will be accompanied by the sergeant-major.

In all cases of reinforcement, the link corporals should meet the flanks of the reinforcing rank or ranks in rear of the fighting line, the non-commissioned officers on the flanks of the reinforcing ranks going out in front to lead them up correctly to the position marked by the link corporals. The men should be carefully trained in rapidly finding their own group.

Captains should be instructed to bring up their own second rank temporarily, where the nature of the ground may make it advantageous or advisable.

The above may suffice for a trial of the system, the advance under musketry fire,

<sup>1</sup> Added since the paper was read.—Ed.

<sup>2</sup> Some may think it better to put them behind in file, but I am inclined to think that to put them close alongside one another is the best arrangement for securing *intelligent* work or mutual help.

<sup>3</sup> On service, grooms for the horses would be necessary.

reinforcing, charge, &c., being conducted generally on the principles laid down in the "Field Exercise."

Colonel FLETCHER, Commanding 2nd Battalion Scots Guards: Before discussing the questions involved in the paper we have just heard read, I may perhaps be allowed to say how much we of the Regular Army are indebted to Colonel Macdonald for bringing his valuable opinion to bear upon this important subject. Very often extra-professional criticism is most valuable; it spurs on the profession to fresh study, and it also brings minds that are possibly not to a certain degree narrowed by looking at the subject from one point of view, to bear upon the matter in question. If therefore I at all criticise what Colonel Macdonald has said, I do it with the utmost diffidence.

In the first place I think a portion of that great stiffness which Colonel Macdonald alluded to, and which characterised our drill a very short time ago, was not so much in consequence of tactics arising from the weapons we then used, as in consequence of the long period of peace. I remember perfectly well about seven years ago meeting the late Field Marshal Lord Tweeddale; he was talking about the reforms then being made in the Army, and after having discussed them he said: "There is 'nothing new in them to me; these are the very things I learned under Sir John 'Moore.'" The truth is, after a long peace, we get into certain fixed habits, and forget that the dry bones of tactics have to be infused with the real spirit of service, in order to make them of any real value.

I think there is also a certain danger (much as I value the Prussian books that have been written), of our getting too much into a German system, for however applicable a German system may be to Germans, and however applicable a French system may be to the French, I think we as English are bound to have a system of our own which will suit our troops, will suit our organization, and will suit our discipline. With reference to the system of attack which is now promulgated in the Field Exercise Book, I would venture to say that it has been a little hardly dealt with by Colonel Macdonald. There is greater elasticity allowed in the Field Exercise Book than has been allowed in the lecture. If I remember rightly, not only may a company be sent forward, but it is also perfectly allowable to send forward a section and to reinforce that section successively by others. I think also it will be found that not only may the supports be ordered up by the Field Officer, but they may be also ordered up by the Captain commanding the supports. I speak from recollection without having referred very recently to the book. The truth is that the new order of attack has apparently been somewhat of a compromise, and seems to contain certain contradictions. I am rather glad for one that there are contradictions, because it allows greater latitude in carrying it out. When your men are in extended order, you must rely upon previous teaching and discipline, and upon what the Germans call "fire discipline." You must have educated your battalion so that when once *lancé* to the attack it may to a certain degree be able to act without the supervision of the Colonel. You must have taught your Officers according to their grades and also your non-commissioned officers, and you must have instructed them so far as possible individually, so that they may take command, and be prepared to act as occasions may present themselves without the direct supervision of the senior Officers.

With reference to the four-deep formation, I think I may compliment Colonel Macdonald on having attacked the present formation of fours which very few regular Officers would have done. We have got the present system so imbued into our minds that we never think of forming fours differently than according to the present method, and Colonel Macdonald has put before us another way of doing it which appears at first sight simpler and better. But with regard to using the four-deep formation as the means of open order attack, I think there is this difficulty. As long as you are acting on a smooth surface, or where everything is perfectly regular, and where the different units fit into their proper places, all goes well; but suppose as you are marching forward to the attack, with your front line of fours, you see a position on your right or left which it is necessary to seize (and this will be often found to take place not only in action but also



on field days over rough ground where you have a supposed enemy in front of you), the Officer using his own discretion moves the support to right or left; immediately the whole system of attack is upset, and confusion becomes worse confounded. Doubtless under the present system there must be confusion: and what you must do is to educate your Officers and non-commissioned officers to act in confusion. You must imitate confusion continually, and you must teach them the habit of commanding men in front of them although these men may be intermingled and of different companies. I think this is the criticism I will venture to make upon the four-deep formation. With regard to the retirement after an attack, you must depend upon having a certain portion of your force well in hand to cover retreat, as I think it is almost impossible to rely upon a beaten force falling back upon the several four-deep formations as shown in the diagram. But supposing this formation were carried out, it would require also a different system of disciplining your company. If your men are to act in four lines in the way indicated, you must divide your company up into four similar sections, so that each of your sections shall be commanded properly according to their formation, and not as at present when standing in line; for nothing can be more important than that your section should be properly and intelligently commanded by their own sectional leaders; and also it is of immense importance that the men who stand together, should act and work together both in field and camp. Therefore, to carry out the four-deep system a new disciplinary formation as well as a new tactical formation would be required. I do not say this as an argument against the system, but point it out as a corollary that should necessarily ensue from its adoption.

Lieutenant-Colonel BLUNDELL, Grenadier Guards: Gentlemen, we must all, I think, agree with Colonel Macdonald in his aim of attempting reconstruction when the line is formed for the final rush, if it is possible, but I for one doubt its being possible. I have had a good deal of practice in skirmishing companies, not in the field but on parade, and I must say I think it quite uncertain if you divide a company (when several companies are acting in line together in extended order), I consider it quite uncertain, if you divide a company and let one-half company support the other half, whether, when you want to reinforce the half company in front, its own half company will reinforce it: you find there is a certain drifting of the line, there is smoke and confusion, and my belief is, if a Captain of a company wants to command his company properly, he should be in the rear of the centre, and that the whole company, not too long, should be in one single line. He has then perfect control, no matter how long it is, he passes orders along the rear, whereas if he has to be hopping between the half company in the front line and the other half company, perhaps a couple of hundred yards behind, the chances are he will lose one, perhaps both. I think we should be very careful about the use of terms. A great deal has been said about the Prussian "company." Now, I contend that there is no doubt the Prussians gained a great advantage by the use of that large company of 250 men, but it was not because it was a "company," but in spite of its being a "company." It acted as a battalion, and they gained their advantages by using small battalions. Their companies became, in fact, small battalions. It has always been considered in the British service that a company of 32 files is about the handiest body you can use, and you find that four "companies," of 32 files, will not differ much from the strength of the Prussian "company"; that is to say, one British half battalion, of four companies each of 32 files. It is as perfect a unit as you could possibly have to use in the field; and if you identified the Major with his half battalion in practice as much as he is in theory, you would at once have what you may term a Prussian "company" if you like the word, but better organized, and, in reality, a battalion composed of four integers, each under, suppose we term them, Commanders, and we similarly styled the Sub-Lieutenants, Lieutenants. I believe that would be the very best arrangement, and I think with our attack formation you would at once arrive at that, if in distributing the companies at first you so arranged it that when your battalion was all thrown out, the reserves reinforcing the fighting line, you had your right half battalion on your right and your left on your left. To this extent I believe reconstruction is possible; the book permits it but it does not suggest it as the normal formation. Then there is another point I should like to mention. Even before the Crimean War, it was a



matter of indifference in what order the battalions stood in the brigade. You might invert them to any extent. It was all perfectly natural, but, at the same time, the companies in a battalion, except in light division regiments, were rigidly kept, as Colonel Macdonald very properly observed, to their particular order. Now, the order of companies in a battalion is a matter of perfect indifference; they change their order at any time and no inconvenience is felt. I believe we have arrived at a time when we must go beyond this. I believe it is a perfect matter of indifference in what order a man stands in his company. I believe you may take a company of men who are properly drilled, and without any telling off at all, you might give them the word "fours right," give them the caution to take their time from the right, just as they do in dressing, and you would find the company would form fours without any telling off at all. That is what we have to make the men understand, that there is no real danger in Smith being on the right of Brown, any more than in Brown being on the right of Smith. We find that custom lingers long everywhere, especially in the Army. It is the commonest thing possible to find a man who would bolt his front door with two bolts, lock it, put a chain upon it, and, at the same time, leave the window within two or three yards of it with the latch undone. That is no doubt custom, the remains of the time when the weak point in all houses was the doorway. So in the Army: in old times the great danger to infantry was a cavalry charge, and the infantry was obliged to be prepared to form hollow square to resist cavalry, with the least exposure to artillery. Now there is no occasion for anything of that sort. The only chance cavalry can have against unshaken infantry is to catch them by surprise, and when infantry is caught by surprise, you may just as well form quarter or close column, or rallying squares, as anything else. The necessity of forming hollow squares was the only reason for being very particular in maintaining the proper order of men in a company, or companies, in a battalion. The last has gone and we ought to accommodate ourselves to existing circumstances in the former.<sup>1</sup> With regard to the formation of fours that Colonel Macdonald has suggested, it appears to be a very simple one, but I think it is a matter of comparative indifference, whether a company, before it commences to advance, is two deep or four deep. I think it is a pity we do not retain the formation of threes for moving upon roads not wide enough for fours.

Captain E. VAUGHAN-JONES, London Irish Rifle Volunteers.<sup>2</sup> I thought Colonel Macdonald's desire for reconstruction was good, but that his scheme for effecting it would be unworkable in a real attack, because the confusion and loss of direction, incidental to troops moving in extended order over broken ground, would prevent his third and fourth ranks (forming his reserve) finding their own companies, as we must bear in mind the great depth between them and the front, and the probability is, that when they arrived at the front (in hot haste), they would be absorbed just where they came up, and that it would be almost impossible that men would arrive so exactly at their places as to reconstruct the companies.

I then stated there were many advantages possessed by the old line formation (which I pointed out), and that I thought it was quite capable of being developed to meet the circumstances of the time, by, as it were, engrafting upon it a workable revised system of attack, and I most respectfully submit, with all deference, the following suggestions (as stated in my paper). Allow the troops to move over a portion of the space between them and the enemy in the old line formation, but with scouts out, which will afford proper command by the senior and more experienced Officers, and when the edge of the zone of musketry fire has been reached (say at 1,000 yards from the enemy, or earlier if annoyed by his shell fire), unleash by halting the left companies (2, 4, 6, and so on) which will form reserve under the senior Major, the right companies, still moving on, form single rank from the right (the direction, touch, and command is then obtained as before). When this single rank arrived to within 700 or 800 yards of the enemy (or earlier if exposed to shell-fire), halt the rear rank men, who will form supports and keep their

<sup>1</sup> It is not intended to advocate disorder, but to urge that when disorder occurs, as it inevitably must, the situation may be accepted with composure.

<sup>2</sup> The following is a précis of a written statement handed in by Captain Jones.

extended order (the Lieutenants to be in charge of these, and the junior Major having general charge of the whole). The front rank men move on, being then in extended order, and form the fighting line under the Captains.

In such a formation the whole would be "in hand," the Captains would have their commands in two ranks (one the fighting rank and the other the supporting rank), with a front of 50 paces for 32 files, instead of 128 paces as at present. The rear-rank men to conform to the movements of the front, so that when the Captains send their links (buglers or sergeants) for reinforcements, they shall be able to fit into their places, or at least join their own companies. These supports could be echeloned or partly so (if found necessary for flank defence); the same must be said of the reserve, it should be in line for the most part, but where a flank is exposed, then the order in which it should stand or move must be determined according to circumstances, but I do maintain that the reserve should be composed of companies in their entirety, as they are then better fitted for flank defence, or indeed any duty.

In the event of a retreat, the front rank and rear rank would alternately retire, each supporting the other, and the reserve would so dispose itself as to check the pursuit.

If the fighting line got good cover whilst under fire, it would be quite possible to restore the old line formation, by moving up the rear ranks and causing the right companies to form two deep on the right and the left companies to move into the intervals, you would then be able to pour in a concentrated fire.

Under such a system as this, men would be held in command and comrade would join comrade (when reinforcing). Every man would be under his own Officers, and all the confusion and clashing of commands, such as at present take place, would be avoided.

Lieut.-General OLPHERTS, *V.C.*, C.B.: I came here this evening quite unexpectedly, and had not the slightest idea of venturing to speak before a company which contains, I am certain, Officers who are far more capable of speaking on the subject than I am. I may, however, state that during the time I was in India, where I had the opportunity of commanding brigades and divisions, an Officer named Lieut.-Colonel Bigge, of Her Majesty's 5th Fusiliers, brought to my notice a system of attack which I tried in the Bareilly (or Rohilkund) Brigade and the Lucknow (or Oude) Division, where it answered admirably. I quite agree with the spirit of what Colonel Macdonald has said, and I am not presuming to say the system I wish to point out to you is better than his; but I desire to mention it to you. It is, in some respects, similar to Colonel Macdonald's. It is based on the company system, but the difference is instead of acting by fours Colonel Bigge acted by sections, and the advantage of that was, as a speaker in front of me said, that the men of each section were under the immediate command of their own non-commissioned officers, and knew them better than they would others. I think that is an advantage. I used to call it the telescope system, it shut up so very conveniently, closed, and became a compact formation, as Colonel Macdonald advocates. I have not read much lately about subjects of this kind, and I am not able perhaps to use all the technical terms that would convey my meaning to you so well as others, but I have simply wished to mention to you as a fact that Colonel Bigge did produce that system, I believe, before any other similar one, and that I found it answer in practice remarkably well.<sup>1</sup>

<sup>1</sup> As an example I give the following plan:—No. 1 Section (it does not signify which section goes out first) covers the front of its own company in extended order; the next or any other section as ordered forms the support, the files being opened out as required; the remaining section forms the reserve. The Captain is usually between the front line and support, with connecting links and intelligent men to convey orders. An advantage of this system over the four-deep one appears to be that by having the support and reserve more compact and in hand, you can protect a flank and reinforce any particular point in the front line more effectually. I have also found it very handy and effective in retiring movements. At the same time I can quite understand that the four-deep system may be an equally useful and practicable one. What is required is that all should act together with one mind to fulfil

Lieut.-Colonel GORDON IVES, 36th Middlesex Rifle Regiment: I am not perfectly clear whether Colonel Macdonald intended the original formation to be four deep or to form four deep from the original formation of two, because there is a very considerable difference. [Colonel MACDONALD: It was four deep from the very first, the normal condition.] That, then, avoids telling off. Some two years ago I happened to be attending the manœuvres in Germany, and I worked this question out with various friends of mine at that time. I had not read Colonel Macdonald's book, but we all thought a four-deep formation was capable of being worked up into a drill which should recommend itself by its simplicity; but in order to make use of it, it appeared to me to be necessary to make a very great change in the system adopted of dividing the company into four parts. If you adopt the four-deep formation to start with, of course you avoid telling off altogether: you form two deep with the greatest possible ease, but then you have a disconnected line, consequently it is necessary to divide that line in some form or other. If you divide it into sections in the way it is done now, you mix up the men in an inconvenient manner; but if you take it that each line forms a section, 1, 2, 3, 4 sections, each line is a section in itself, it obviates this entirely, and each line forms a competent body in itself. If you subdivide this again, making the men tell off from one flank to the other, you avoid all telling off that is not done by the men themselves, and in various ways you can get one of the first principles of the drill of the Prussian Army, which is the group of eight to twelve or sixteen, each group commanded by a leader, which is the foundation of their first line. The difference between the Prussian line of attack and that of other countries, as far as I have seen, is that they subdivide their line entirely into groups of eight, twelve, or sixteen men, generally commanded by a sub-officer, whose duty it is to superintend the doings of these men. When the reinforcement of the front line takes place, what with us would probably be a section, would with the Prussians be really and truly probably nothing but a group, which being very small is easily sent into the front line; whereas a large section in companies of 80 to 100 men, if subdivided into sections, is no longer a small body of men to bring into the front line, and requires a gap difficult to form and fill up, or as is now done the men are all mixed up. A very important part of the Prussian system is its perfect uniformity. Go from one end of Germany to the other and you will see exactly the same drill. Our drill-book leaves us so much liberty of action that at the last moment, when at manœuvres, we are going to attack an enemy, it may be by the right, left, or centre, but nobody has ever been able to tell me for certain where the centre is, whether the centre of a brigade, division, battalion, or company. What we seem to want is not to be told how a thing can be done, but to be told exactly what we are to do. Commanding—never mind what—a battalion, a company, two men if you like—I do not want to be told I can place two men 5 yards or 100 yards apart: I want to be told exactly

a particular purpose, while each individual develops, as far as possible, his own special qualities, like as a pack of wolves, guided by instinct, collectively and separately follow up and attack those they pursue and seek to devour; while bodies of men, guided by reason and actuated and animated by discipline and principle, endeavour to frustrate and overcome each other's designs by masterly and scientific combinations, in which the power of the superior mind, which directs the whole, increases in proportion to the greater amount of individual intelligence which it reflects.

*Rough Sketch of Company advancing to the Attack.*

No. 1 Section.

. . . . .

No. 2 as Support.

. . . . .

3 and 4 Reserve.

. . . . .



what I am to do with my two men by my superior Officer. And if that is applicable to the two men, how much more applicable is it when you come to your 50,000, 100,000, or 200,000 men. How impossible it is to imagine the confusion that will arise unless every individual knows what he is to do. It is no good talking of discipline unless a man knows what to do; however willing he may be, he cannot do it. What we want, is not to be told to advance by right, left, or centre, but to advance under a general rule, any deviation from which rule to be such an exception as will make a mark upon our minds. I do not know that these remarks are very relevant to the exact question before us, but what is relevant is to get a system of drill which cannot be deviated from except in rare instances, carrying with them great responsibility. It is perfectly true, as Colonel Macdonald said, that in former days each company had its particular place, and there was, in my opinion, an advantage even in that; and there would be still if each company or each man knew what he had to do. I doubt not but that the result of this discussion will be that my suggestions will be considered by the many distinguished Officers present, and finally settled, so that when we have to face the enemy we shall know what we really have to do, and then I feel perfect confidence that there are very few of us who will not do it.

**Captain WOODHOUSE:** Colonel Macdonald has confined himself almost entirely to the consideration of the subject as it affects the smallest tactical unit, viz., the company. This must be my excuse for venturing to make a few remarks in the presence of so many of my seniors. As a company Officer I wish to thank Colonel Macdonald for the boon he would bestow upon us. There is not a Captain in the Army who would deny that under the present system the moment of victory is one of inextricable confusion; what the upshot would be if, when the men fix bayonets, quicken their pace and charge, defeat, and not victory should ensue, the drill-book does not inform, nor the orthodox parade instruct us. Officers, however, have a shrewd suspicion. The commander of a skirmishing company labours under many disadvantages at the best of times, but not till he has been reinforced once, twice, and thrice by successive supports, and not till fresh men and strange faces have been wedged in between his own men, and he himself is surrounded by Officers and non-commissioned officers of other companies, can he really be said to have reached the climax of helplessness. The "four-deep" system seems to remedy most of these evils by diminishing the front which he has to control, by giving him undivided command over each reinforcement as it arrives, and by ensuring mutual acquaintance between each unit of the fighting line and its particular commander. No doubt actual experience would induce modifications here and there, but for the proposal and for the principle of the scheme the thanks of all company Officers are due to Colonel Macdonald.

**Colonel RADCLIFFE:** Sir Garnet Wolseley, I have very few words to say on this subject. I had the privilege some years ago of reading a pamphlet by my friend Colonel Macdonald on this very subject, and I thought then, and I have always thought since, that a great deal ought to be made of this system of fours deep, and I cannot say that I have heard anything this evening which has altered that opinion. Colonel Macdonald's lucid explanation of the system made it quite clear to us all that there was a great deal in it, and I do think it is well worthy of the military authorities' consideration when they bring out a new drill-book, which I suppose will not be very long—a very few months—it is some months since we had a new drill-book. I do think that this matter requires very great consideration on their part before they dismiss it. The important part to my mind always has been, in this formation, that it does give the Captain a command over his company which he gets under no other system. Colonel Macdonald's principle is that the Captain should go out with the fighting line, which should not be an unmanageable line. It is all very well to talk of the Prussian company of 250 men and the Captain commanding that, but you must remember the Captain of that company is a mounted Officer, and pretty nearly takes the place of one of our Majors. In these days of firearms of precision it is decidedly a very great objection to have too many Officers mounted. Those of us who have the privilege of being mounted would I think keep as far out of the fighting line as possible if we did not obey the order of the present drill-book, which is to dismount under fire. I certainly should obey most implicitly that order myself, and I think all other Officers who look to their duty of superintending the troops

under their command would be wise to do the same. Now, as our Captains at present are not mounted, it is a most important thing that they should not have to double up and down a line over which they can have no possible control unless they are really ubiquitous. The great advantage of this system is that the Captain can call up his support by the connecting links whenever he finds it necessary; he can also call up the company reserve, the Officer commanding the battalion reserve having the same control over it as under the present system. But I think there cannot be the slightest doubt in any reasonable mind that it must be much better for the first support and the first reserve to come from men of the same company, and that there would be much less likelihood of the men getting into confusion. There would be the greater probability of their quickly rallying, if they belonged to the same company, than if they belonged to different companies even of the same battalion. It has been said to-night you would have men drifting off in one direction or another, and, therefore, that your supports and reserve would not come up and support in the right places. Does not that equally apply to the supports and reserves under the present system? If a commanding Officer at a distance can send up supports and reserves to support the fighting line under the present system, surely a Captain calling up his own supports and reserves with his own connecting links will do it much more satisfactorily. I do not think, however, that this is a perfect system; it will require a great deal of working out. Colonel Fletcher, of course, knows a good many of the difficulties there would be in the interior economy of the companies as to section commanders and so on, but no doubt those difficulties could be very easily got over; I do not think there is anything that could not be got over by half an hour's steady thought and working out. I was very glad to hear from a gentleman on the other side of the room (Colonel Blundell) that he had such a very high opinion of soldiers in general, and I hope also of Volunteers, that telling off was quite unnecessary, and the men would form fours simply by taking the time from the right. I should be very glad to see any battalion do it. I doubt whether Colonel Fletcher would like to call upon his regiment to do that sort of thing at a moment's notice. I know I should be very sorry to call out my battalion and ask them to do it. I am very glad to hear it can be done; of course, if so, it is a very great advantage, a very great thing indeed.

Colonel BLUNDELL: I shall be happy to do it with any company of your battalion.

Colonel RADCLIFFE: I am very glad to find you have so good an opinion of my battalion. I should be very sorry to do it myself, but I think it is a very great thing that such a thing can be done. Of course, as long as we have the present system, we have to go through a great deal of difficulty about numbering and telling off, and if we can simplify the system it would be a very great advantage. If this lecture tends to help us over these difficulties we shall be very much obliged to Colonel Macdonald; at any rate, we are very much obliged to him for the lecture he has given us.

Major-General A. CUNNINGHAM ROBERTSON, C.B.: I venture to say a few words because I have actually tried Colonel Macdonald's system. Some time ago he published a small pamphlet in which the principles of his system were very clearly laid down, and which I read with great interest. About the time the Cannock Chase camp was going to be formed, I thought it would be a good thing to try the system recommended. As a matter of drill in a barrack square it works with the greatest ease—you can form your company four deep, send forward successive ranks, reinforce, and reconstruct to the front, or retire and reconstruct to the rear. It is a very easy matter; but I never had had the opportunity of trying it over half a mile or a mile of rough ground, so that I really do not know whether the difficulty caused by the drifting of the ranks in rear would be very considerable or not. That would be the chief difficulty; but I do not see any impossibility in overcoming it by throwing out a sufficient number of connecting links between the fighting and supporting, and between the supporting and reserve ranks. Concerning the objection Colonel Fletcher made that it would clash with the squad system, I think in small companies not exceeding 100 men the squad system is not a very real system. The nominal roll, it is true, is divided into squads, but the men themselves are differently divided. For tactical purposes they are told off in half companies, sections, and

fours; for the purposes of supervision and discipline they are told off sometimes by rooms, sometimes by tents, sometimes by billets, and sometimes by messes, but neither do the tactical nor do the administrative fractions ever correspond with the divisions of the squad roll. Considered as a tactical formation there can be nothing more distinct than four ranks, the men of a company can work in four ranks as well as they can if you divide them into four sections. For tactical purposes the company should always be treated as an integer; the relation between the Captain and the individual soldier should be direct. The Captain of 100 soldiers should be the commander, not of four sections, but of 50 files. When it is necessary to form the men of a company or more than a single alignment, it is better that their change of formation should be effected by opening the ranks of a four-deep line than by forming column of sections, opening, and extending. As regards the opinion held by many Officers that because it has become expedient in formations for attack to form lines of infantry with intervals between their files, therefore it will be a tactical advantage to increase the strength of the company from 100 to 200 men, and to diminish the number of the Captains of a battalion from eight to four. This opinion, whether correct or incorrect, does not at all effect the discussion of the advantages of Colonel Macdonald's system, which may be applied with exactly the same facility to strong companies as to weak.<sup>1</sup> It is one of the great advantages of the system that the strength of the company being given, whether it be 20 or 50 or 100 files, it provides means for securing intervals between files without increasing the extent of the front of the company even by a single pace. The objection that the interval between the files is not sufficient, and that the men are too thick, is I think just. Some months ago I printed a little pamphlet in which I suggested a modification of Colonel Macdonald's system, whereby this defect would be remedied and the intervals between the files trebled. This pamphlet may be seen in the Library of the Institution. During the summer of this year I hope that all modifications of the system of four-deep formations may be thoroughly tested at Aldershot and elsewhere by forming first single battalion and then brigades in lines, advancing rapidly without halting and keeping up a brisk fire over 1,500 yards of ground, and then halting and reinforcing. If by means of connecting links, or by any other expedient, the advance of the supporting reserve ranks can be so conducted as to prevent drifting, so that on the command to reinforce, the four ranks of each company are reunited and the company reconstructed without confusion, this will be a conclusive test of the success of the method, and will prove that it is well suited to the exigencies of war.

General MCMURDO: I have very few words so say. I do not stand up with the intention of entering into the details of this discussion, or of Colonel Macdonald's proposal. I wish only to express my great pleasure, first of all in seeing my gallant friend Colonel Macdonald after so many years separation, and to find that he still has that active and intelligent interest that he had in former years in the tactical formation of the British Army as well as of the Volunteers. He possesses the instincts of his name—the name of John Macdonald, the Adjutant-General at the head

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<sup>1</sup> It is very difficult to understand by what process of reasoning any one can arrive at the extraordinary and paradoxical conclusion that one special effect of the change from a compact to an extended formation, is to render it *tactically* advantageous to increase the strength of the company and to diminish the number of companies in a battalion. The extent of the front of a company of 100 men formed in two ranks at close order is 33 yards, that of a company of 200 men formed for attack, as directed by existing regulations, with intervals of four paces between files, is 166 yards—that is to say, the effect of the proposed change in the organization of the company and battalion would be to decrease the ratio between the number of Captains and the number of yards in the front of the line-of-battle in the proportion of one to eight, to commit to the supervision of a single Captain the same extent of front for which, in the close order formation since the time of the Romans, eight Captains have been considered necessary. To maintain that such a change is a *tactical* advantage must surely imply some confusion of thought regarding the true conditions of the question discussed.



of that department of the Army which is charged with formation and movements is well remembered at the Horse Guards at the present day, and I am delighted to see his nephew coming forward in the same line. I will confine myself simply to the question of the principle of attack. I entirely agree with Colonel Macdonald in his principle that the attack should be made by bodies that will be capable of being consolidated and formed at the point of attack in the order in which they start, or that if compelled to retire, they should do so, so as to reform equally in the same order. That I conceive to be the one great principle. Although, as a soldier, I am delighted to carry out any order of attack that may be given me, to instruct troops under my command, still, as we are here discussing the subject, I must say that I do not approve a principle of attack that culminates in confusion even if we are successful, and that might end in disaster if we are not successful. In regard to the details of Colonel Macdonald's proposal, I do not wish to enter into them. It appears to me that they are very cleverly conceived; though it strikes me the order is rather close for carrying out under fire. We should like to be a little more extended. He did propose, however, that the first line on going into action might be eliminated, by the best shots being sent forward and so a looser order might be gained; but on the whole I think that it is rather close order. However, that is a very minor point, and it can be modified and altered according to men's minds; but the principle I entirely approve of, which is, that of keeping to, or at least easily regaining, our regular order of formation.

Major-General WARRE, C.B.: There is one point I think Colonel Macdonald has omitted to mention, and that is, the question of non-commissioned officers; for, however perfect his formation may be, I do not think he can command it without the aid of non-commissioned officers.

Lieutenant-Colonel Lord ECHO, M.P., Commanding London Scottish Rifle Volunteers: I can assure this distinguished company that if it had not been for some sort of command, some sign made to me by Sir Garnet Wolseley, I should not have ventured to have spoken, more especially as several Volunteer Officers have already spoken, and I am sorry to say we have not had as much criticism as one hoped to hear from Officers of the Army on this most important question. It would be most impertinent in me to pretend as a civilian to criticise what the military authorities, after many years' gestation, have produced in the way of the last form of attack; but I hold myself, not having seen it in practice, but simply having read it on paper, that what General McMurdo has said appears to be the truth with regard to it, that in success it will culminate in confusion, and if unsuccessful in disaster. Where companies are mixed up, where even if you are in brigade, battalions will be mixed up when they come to reinforce the originally extended battalion, it appears to me, as Colonel Macdonald has said—speaking as a civilian with no experience of actual warfare—you must more or less tend by this system to inaugurate confusion at the very commencement. As the matter stands between the two systems, there may be no doubt objections such as Colonel Fletcher has mentioned with reference to Colonel Macdonald's proposal; but of the two it appears to me to be founded on a much sounder system than the one which has been published as the new attack, and to be simpler in itself. Colonel Fletcher made one remark which struck me very much, and it was this: he said the whole secret of the new attack was to educate your men individually. Now I think what one ought to recollect is this: that you have a very young army to deal with, consisting in a great measure of recruits and boys, and if you have a system which, according to General McMurdo, even in success will culminate in confusion, there is still greater danger of disaster, considering the elements with which you have to deal. I know that Sir Garnet Wolseley is quoted as an authority for preferring young soldiers to old soldiers. But there are young soldiers and young soldiers, if I may so say, and though I hear General Sir Garnet Wolseley quoted as an authority in favour of young soldiers, I should be very much surprised, if I were to hear him say that by "young soldiers" he meant raw boys of from 16 to 20 years of age. I rather gather, when his authority is seized upon in defence of sending these boys into the ranks at this early age, that he means that he would prefer a soldier of 20 or 30 to a soldier of 40, and that he looks upon the Prussian military age as the best age, beginning with soldiers at 20 and taking them to 32, and that he means

by that young soldiers. I think that is a matter that ought to be considered, that you should as far as possible adapt your system to the troops, and that the system at present laid down is one likely to lead to confusion by the mixing up of units, and that the sounder principle is that advocated by Colonel Macdonald. I must apologise for what I have said, but that is what strikes a civilian, in looking with a common sense eye at these simply military questions.

Lieutenant-Colonel HENRY BRACKENBURY, R.A. : May I venture, although not an infantry Officer, to make one or two remarks on this subject? I quite agree with Colonel Fletcher, and I think every one here will, that we should not adopt anything simply because it is German. That danger, I venture to say, is Scylla; and on the other side there is Charybdis, which is the danger lest we should reject anything, simply because it is German, and there is a little tendency, I think, in a good many minds to do so. The Germans, I think we must all admit, are an eminently practical people, especially in military matters; and having seen something of the German troops during their war with France, and having had opportunities of conversation with German Officers, I venture to say there is one great principle—not a matter of detail, but a great principle—which pervades their whole system of infantry formation and infantry attack; and that principle is the division of responsibility. Just as our battalion is divided into companies, so are their battalion and company divided and subdivided, the great essential principle being that no matter how small a group is separated from the force, it is an organized unit. They subdivide their company into groups; each of those groups is trained to work together under a non-commissioned officer, who is constantly and permanently with it, who knows every one of the men composing it, and to whom they are always accustomed to look. I tried many times during the war of 1870 to get past a German outpost. I have gone with all the papers imaginable in my hands, but I never could succeed in getting at once through an outpost. Every time I was met by precisely the same rigid formula:—"There you must halt till my non-commissioned officer has been called." My non-commissioned officer comes and he says, "Here you wait under charge of two of my men till my officer has been called," and "my Officer" referred me with an escort to the Field Officer commanding the outposts, perhaps a couple of miles back. I have gone through French outposts without such formality over and over again, and I am certain the one thing that makes the German outpost system so complete is that the chain of responsibility is absolutely complete. It is exactly the same thing in fighting. No line, with a front of 25 men, I venture to think, can possibly advance over broken ground, for anything like the distance which men have to advance to the attack, without getting broken up into fragments. And I should be extremely glad if Colonel Macdonald would point out to us how he proposes to divide his company, as it there is, into sections, or into fire groups, so that there shall be complete control by the non-commissioned officer in charge of each of those groups? In the ordinary formation in two ranks, both ranks advance together, and if a section or group of 12 or 8 men advances, it advances all at the same time, and its leader advances with it. But suppose we have a group of 12 men under this system, they are in four ranks. Three men advance from the front rank. Is the non-commissioned officer to go with them? Three men follow—is he to go with them, or is he to remain with the six behind? I shall be very glad if Colonel Macdonald will explain to us, in some way, how he proposes this subdivision of responsibility under his system.

Colonel MACDONALD : I am sure I use no mere words of course, when I express to this meeting my thanks for the extremely kind and generous way in which they have received my paper, and I cannot help thinking the principles I have advocated have been highly honoured by receiving criticism from the gallant and distinguished Officers who have taken the trouble to come here to-night and to address this meeting. I cannot help feeling that in one thing which Colonel Fletcher said I agree, though in quite a different spirit, namely, in what he said about the allowable things in our drill-book, and about a great many things in our field exercises book being matters of compromise. Speaking as a Volunteer, I am sure I express the opinions of every Volunteer Officer, by saying that one of the greatest misfortunes about our drill-book is that it contains so many compromises; you are given two or three



ways of doing a thing, and you have the fear very much that you may choose the one which your inspecting Officer does not like, and, accordingly, you generally take the old one, and the new one, which is infinitely better, but does not please the old minds, is practically set aside. I will give you a practical instance of that. There was introduced, some years ago, a substitute for the old gate-wheel, a process of forming by which the men came up much more rapidly, as accurately and as neatly in the end, into the position into which they were to be brought, instead of being made to do the most insane thing on the face of the earth—to touch one way and look another. I venture to ask any gentleman in this room, whether, within the last six or seven years, he has ever seen anything of the kind done, except on some occasion when his corps was turned into some place that was not flat, and when, though he gave the order to wheel, the result was the forming process. No doubt it is a valuable thing to have experiments on, but I think they should be tried before their publication by Her Majesty's authority, and when a mode is found of doing a particular movement, it should be decided, either that it is preferable and is to be substituted for the old mode, or it should be decided that you are not quite satisfied with it and will leave it out altogether.

As regards the difficulty suggested by Colonel Blundell, about the Officer commanding so many men in front, who are out in the attacking line, and the difficulty he would have in hopping backwards and forwards between those men and the men behind, I rather think that proceeds from a mistake. The men in support and the men in reserve have nothing to do but to wait till they get orders, and the orders can be as readily sent to them, by word of mouth, or by a note written upon a piece of paper, if that be necessary, as by the Captain hopping back himself to do it. I certainly would highly disapprove of his doing so. He can take hold of them the moment they come up near him, but as long as they are behind, they are simply like people waiting until a message is sent to them, and they have to obey that message. When they are brought up by the Officer on the spot to the front, then they fall at once under the direct command of the Officer taking charge in front. I may here just say a word with reference to Colonel Brackenbury's reference to my not having stated anything as to the detail of adjusting commands. No doubt that is a very important matter, and it is one about which my experience did not enable me to make efficient suggestions; but what I would say is this, that it does not appear to me, after hearing Colonel Brackenbury's question, that there would be any more difficulty in effecting good grouping under this system than under any other. It occurs to me in this way. Of course, if you have men out in front and the men who are to come up behind, both in the support and in the reserve, those men may be practically one group, although they are individually for the time separated from one another because they can have a thoroughly integral cohesion. The only separation between them is one of space, but the whole concentration of the minds of those men who are behind, and of whoever is in charge of them for the time must be upon this, that their future position is alongside of the men of their own group, and, therefore, I do not think that would create a practical difficulty. Take, for example, the case of our 25 men of a company of 100 thrown out first. As men came up from the support they would fall each into his own group; the non-commissioned officer out in front would just receive and put them into his group, exactly in the same way as he took charge of the men already up. That was my idea of it, although I cannot profess to state it in detail.

Then, as regards drift and loss of direction, I think it is rather hard that anything should be said against a proposed system on that ground, because I have not heard it suggested that any system has ever been devised that has prevented drift and loss of direction. But I am rather inclined to have the courage to claim for my idea the prospect of less general drift and loss of direction than results from any other system.

Colonel Brackenbury said, with great truth, that the thing that is wanted is that every man and every non-commissioned officer and person in charge of the men should know exactly what he had got to do. In our old system the thing was, as was said by one of the speakers, you had to advance by the centre, right, or left. I think the day for that is completely gone. That is a bowling-green principle, utterly inapplicable to broken ground. What you want is such directions given as



that the flank of a battalion shall be brought up to a particular point ahead, and the other flank up to another point ahead, and then you cannot drift unless you disobey those orders; you may get a little thicker at one place and a little thinner at another place, but there can be no drift of your main body at all. I am inclined to think that we make a mistake in making our support follow, in parallel line, with our advanced line, and I have often wondered whether it would not be a much better plan that the support should have its two ends moving in a kind of echelon of men, so as to be keeping up its connectedness at one end with part of the force in front, and at the other end with the reserve in the rear. Of course the flank from which you advance from the support would depend very much on where your enemy's artillery were, but I cannot help thinking that if some connectedness were kept up in that way, you would prevent two things, first, loss of connection, and second—

Colonel GIPPS, Scots Guards: Take this to be the right of your support, what is your right hand man doing while your left hand man is keeping up there?

Colonel MACDONALD: As long as he is standing still there he is the luckiest man of the whole, because he is beside the reserve which is supposed to be under cover.

Colonel GIPPS: In taking positions there will not be cover for every man who has to stand still. Take the man next to the right hand man, there cannot be cover for him too; you cannot have them all under cover.

Colonel MACDONALD: Each man will be exposed according to the position in which he is, and it is perfectly obvious if you put them in a diagonal instead of a parallel, they cannot all be in equal danger.

Colonel GIPPS: The object is to get the men up to the front.

Colonel MACDONALD: When you want to push them up into the line they will all go as fast as they can. I do not see that working it in a diagonal would expose any man a bit more than he is exposed now. On the contrary I was going to suggest, when Colonel Gipps put the question to me, that it is perfectly certain that if your support can be fired upon at all, and you keep it parallel with the front line, your enemy has only to know the distance that your support is behind your advance line to fire upon it with very great certainty if he has opportunity of doing so with his artillery, whereas if you worked it alternately, pushing up this side and then the other side, the enemy would not have a chance of doing so. But, however that may be, I think the question of keeping up the connectedness between your advanced line, your support, and your reserve is the same, whatever system you adopt, with this difference only, that in cases where the support and reserve belong to the same tactical unit as the advanced line you have the interest to keep up a careful connectedness—you have the interest of common comradeship to keep it up, whereas in the other case you have nothing of the kind. It is quite certain if any mistake occurs it is less likely to cause serious damage because a mistake will only extend along a line of twenty-five instead of a hundred men. With twenty-five men you are pretty certain to have them well within reach and call, whereas with a hundred men, seventy or eighty may be completely out of your sight, and may be gone, and you will never find them for the rest of the day. I was present at the autumn manœuvres in 1872, and there were two engagements on successive days, on which I should have felt very much ashamed of myself, for before I had been three-quarters of an hour in action, I had only about two companies out of my whole regiment, if it had not been that the battalion of the Rifle Brigade close beside me was exactly in the same predicament. Referring to what Captain Jones said about the shoulder to shoulder, and the electric sympathy between men rubbing shoulders together, that is all very well as long as they are rubbing shoulder to shoulder; but if the effect of your bringing them shoulder to shoulder is that they are reduced practically down to being at four deep interval, and with only two ranks, your electric effect is gone and half your force is gone too.

General Olpherts spoke of the telescope principle, but I think my telescope is a better one than his, for this reason. In my case each group of four men is a telescope; the first man in the front pushed out, when the next follows him and the next follows *him*; each group is a telescope, each company is a telescope, each battalion is a telescope, and the whole brigade is telescoped exactly on the same principle throughout; whereas if you take the sections of a company and divide

them, you are just clubbing in exactly the same way, only in a less degree as you do if you club companies or battalions.

General OLPHERTS : Mine was more on the binocular principle.

Colonel MACDONALD : Let me say in conclusion, that if the paper I have been able to read to night contributes to a full discussion of the question I shall be fully rewarded for my trouble, and I beg to express my thanks to you for the great and kind attention you have given me.

The CHAIRMAN : Gentlemen, Colonel Macdonald began his very interesting lecture by apologising for his presumption in addressing an audience composed not only of Volunteers like himself, but also of regular soldiers. I venture to concur in all the remarks that were made on this point by Colonel Fletcher, because I think it is of the greatest possible advantage to the Army generally, that questions like that at the present moment under our consideration, should be considered and should be thought and written about and talked of not only by professional soldiers but by all Militia and Volunteer Officers ; in fact, I would go further and say, that if you look back to all the great reforms that have been effected, not only in our military administration, but I might say in our tactical formations, a very large proportion of them have been at most forced upon the Army by outside pressure, and that outside pressure has within the last fifteen or sixteen years almost invariably come from the Volunteer force. Now, like Colonel Radcliffe, who told us he had some years ago read Colonel Macdonald's pamphlet on this subject, I also read it, and with the greatest possible attention and interest, and it struck me then, as it strikes me now, as being a most simple solution to a very great and difficult problem, the problem which is now of most interest to all armies in the world, and especially to us at this present moment, that is, the problem of what is the best formation to adopt whilst engaged in getting over the space, especially if there is no cover, that must intervene between your line of battle and that of your enemy. As far as I have able to follow the lecturer and understand the process by which he means to solve this problem, it is a very simple one. Hitherto we have been in the habit of sending out companies, and extending them to very great distances, whereas he, on the other hand, has adopted the very simple process of sending out the successive ranks of his companies as skirmishers, supports, &c., each of which ranks covers the same extent of front as the company itself when deployed. By this means he secures a great unity of action for the company, and he also provides for the great desideratum which I believe is essentially necessary in these matters, viz., that the Captain should be able to exercise due and efficient command along the extent of front over which his men are acting. I think of all the great mistakes which can possibly be made in tactical formations, the greatest is to send out a Captain and tell him to look over a company of 100 or 125 men, extending over 150 or 200 yards. As far as I can make out, the system laid down in the drill-books at the present moment is that two companies are sent to the front, and are told to spread over an extent of country representing what a battalion deployed in line would occupy. It is however, I am glad to say, also laid down that there are alternative measures open to the colonel commanding a battalion. I do not quite fully concur in the remarks made by some speakers upon that subject, when they said it was absolutely necessary that it should be laid down in the drill-book in the most stringent manner that you should always do a certain thing at a certain moment. I believe nothing could be more fatal than if a Commanding Officer's hands were tied, and he was told that under all circumstances he must always employ the same formation. I think it is open to complaint, as that complaint has been made this evening, that the drill-book as now published recommends to the Officers of the Army a system that I believe it would be absolutely impossible to carry out in the field. I do not myself believe it would be possible for any man to command effectively a company extended over 100 or 150 yards. During my career I have had several opportunities of commanding skirmishers in action under the old system of leaving three or four paces interval between the files. During the Indian Mutiny my company numbered over 100 men, and I can say most positively, that upon every single occasion when it was employed in skirmishing order, before I had been long in action I had lost about one-third or one-half of it, not killed or wounded, but lost sight of altogether for the time being. I could exercise no influence over the skirmishers at a distance from me ; they dis-

appeared, got into hollows, into ditches, and behind houses, and I was able to give them no impulse whatever. I commanded the small number of men that were round me, but the others disappeared altogether. I found them at the end of the day, but during the action they were entirely lost. That was so thoroughly impressed upon my mind that when I hear now-a-days gentlemen who are blind worshippers of success, and blind worshippers of the Prussian system, I always feel inclined to ask them, "Have you ever commanded 100 men in action?" because if you have commanded 100 men, extended in the old skirmishing line, I am quite convinced you would never recommend that a Captain should be told off to command 250. If there is one thing more true than another it is the principle that has been recommended by Von Scherf and others, which is that all formations for tactical purposes should be in depth and not in breadth; that whether it is a Colonel, or a Captain, or a Brigadier, the great thing is to contract the extent of front over which he is to exercise immediate command. Give him any depth you like, let him have two, three, four, or five lines, one behind the other, but let the extent of front over which he is personally to direct his troops be as narrow as possible. And to come down from great things to small things and take companies, I think what was said by General Robertson is most true, that it is most desirable in laying down a drill for our regiments to accept the principle that we should have small companies, and that a company should never extend over more than 50 or 60 yards. I believe that distance can be almost laid down by physical laws; your voice does not extend during a great row and noise over more than that distance. You can scarcely see in action more than 50 or 60 yards, therefore I would lay that down as the general limit of extent to which companies should extend in action. If that is true, the system recommended by the lecturer, of having four lines, is a most simple one. I do not know whether any gentlemen here are well acquainted with the American system of skirmishing, but it comes very much to the same thing as that recommended by Colonel Macdonald. It is not exactly the same principle of formation to begin with, but it amounts to very much the same thing in the end. They tell their men off in fours; each No. 1 goes out to skirmish. The next man who goes out to support him is No. 2; then No. 3, and then No. 4, each leaving his rear-rank man behind him. When, therefore, the whole of the front rank is in the skirmishing line, the rear-rank men in rank-entire still remain as a support. When the front rank, whilst so skirmishing, wants support, each No. 1 of the fours of the rear rank goes to support him; if further support is required, then No. 2 and so on. It is very much the system that Colonel Macdonald recommends, except that it is partially inverted, the *modus operandi* being somewhat different. I think Colonel Macdonald's system of fours is a very simple one. With reference to the Americans, most of their formations are in fours. For many years past they have adopted a great simplicity of drill, which I am glad to see the authorities of England are becoming alive to the necessity of our adopting also; indeed, that great rigidity of movement, which we had borrowed from Prussia, is, I think, gradually disappearing from our drill-book; and I, in common with a great number of others who are thinkers upon these subjects, congratulate the Army upon the fact. Still I must admit that I am a great advocate for drill. I often hear people say drill is of no use. Now I think drill is of the greatest possible use, but I am all for drill of a very simple, practical, and instructive nature. I contend that it is quite possible to make a recruit into a drilled man by drilling him to useful formations and in movements of common occurrence during war, and that it is an absurd waste of time to occupy the hours daily devoted to drill, by putting him through evolutions that he never can possibly use on active service. The more you make your drill resemble the manœuvres and evolutions you must employ in the field, the better; and as I believe the days of all stiff movements are over, I think we ought to consider what takes place in action, and reasoning back, adapt our drill to meet that contingency. Hitherto we have had some preconceived extraordinary notion of what battles ought to be, and we have drilled up to their fancied requirements; but we ought to do exactly the reverse; we should find out what an action really is like, and then modify and adapt our drill to provide for these tactical realities. Now I certainly believe the culminating part of any action is utter confusion. I do not care whether the soldiers are Germans, French, or any other nation; the actual culminating point, the decisive



moment of any battle, is an exciting confusion. Therefore I think in our drill we ought to accept that confusion, to prepare for it, to recognise that it is an absolutely essential part of every general action to drill up to it, and frame our regulations with a view to meeting it, and not to ignore it and say it is a thing you ought to avoid. You cannot avoid it, and as you cannot avoid it you ought to be prepared for it. There are two points to which I do not think sufficient importance was attached in the discussion. They are not great points, but still I do not think enough prominence was given to them, especially as one of them is not remarked upon in our drill-book. I believe the day has come when colours can no longer be carried in action. I do not believe it would be possible to carry a battalion's colours up to the enemy's line, and I hope the gentleman who thinks otherwise, and who recommends that in our next war we should still retain their use, will have himself to carry them in action, and I wish him joy if he does. That is my opinion, and I think anyone who considers the matter will concur with me. I would remind those Officers whom I have the pleasure of addressing, that we have more colours than any other nation in Europe. That whereas most nations have perhaps one colour to a battalion at the outside, and some only one to a regiment, we have two colours to every weak battalion in our Service; in fact, we certainly have three times as many colours, and in some instances six times as many as other European nations. The other point I wish to remark upon is the question of mounted Officers. We are told that the German company of 250 men is kept in very good order because its Captain is mounted, but I think if you read the accounts of the German actions during the war of 1866 and the last war, you will find it recorded most distinctly that the Captain, the moment he came under fire, was obliged to dismount; in fact, if he did not, either himself or his horse was shot in a very short time. Therefore I think the question about the possibility of having large companies because you can have your Captain mounted, is a myth. Your Captain cannot be mounted in action. If a Captain is to lead his men to attack the enemy, he must be on foot, and this is one of the many reasons why I believe small companies an immense improvement upon the large companies which are now so much in vogue with many of our army reformers. Colonel Blundell, I think, remarked upon the peculiarity of our drill being of a very mechanical nature, and so it is. We still retain a certain amount of mechanical process in drill. The fact was, he hit the nail on the head when he said it came down from the time when all our drill formations for the infantry were made under the terror of cavalry charges. The great idea that pervaded those who wrote our drill-books in times gone by was the necessity which existed for infantry being at all moments during an action, even when on the move, prepared to receive cavalry; therefore it was that our companies during all evolutions were kept in the most regular order so that they could at once close and form square. Those days are past and gone, because we know now we have very little to dread from great charges of cavalry, if we know how to make proper use of our rifles. I am very glad to have this opportunity of speaking about a point raised by Lord Elcho. He referred to an opinion which he says he has heard expressed as emanating from me upon the subject of young soldiers. I certainly have a great preference for young soldiers, but I have the greatest possible dislike to boys, and I think there is an immense difference between the two. I have never been so wild as to wish that any regiment, or portions of Her Majesty's Army, should be composed of boys. I believe, and I say it with great earnestness at the present moment, I have the greatest horror and dread of seeing any regiment of boys asked to stand up against a regiment of men; such a contest could have only one ending, for men are men and boys are boys. I have nothing more to add on the subject which has been so well discussed this evening. Whatever may be the difference of opinion existing in this room in reference to the remarks I have made, and to the theories brought forward this evening by Colonel Macdonald, upon one point I am sure you are all agreed with me, and there will be no dissentient voice, that is, that we are all deeply indebted to Colonel Macdonald for a most interesting lecture. I am sure I may consider myself authorised, in the name of all present, to thank him most sincerely for having brought this very important subject to our notice.

## LECTURE.

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Monday, May 3rd, 1878.

GENERAL SIR ARTHUR A. T. CUNYNGHAME, K.C.B., &c., &c.,  
in the Chair.

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### THE POPULATION, PROSPECTS, AND FUTURE GOVERNMENT OF THE TRANSVAAL.

By G. PIGOT MOODIE, Esq., F.R.G.S., &c., &c.

DURING the past year South Africa has attracted more than its accustomed share of public attention, owing in part to the annexation to the British dominion of an extensive tract of territory in that quarter, but also to the less gratifying intelligence received from thence of the recurrence of one of those intermittent and dreary Kafir wars, which not alone afford no glory but have proved so serious a bar to the progress of the Cape Colony, and have occasioned so much loss of life and of treasure both to that and to the mother country. Successive mails have also of late brought further news of outbreaks threatening among the tribes within and adjacent to the new possession; and it is owing to the interest that has been thus excited, and to the fact of information on the subject not being generally accessible, that with much diffidence I now venture, in compliance with the request of the Council of the Royal United Service Institution, to lay before you a few of the facts concerning it, which a residence there of some years has enabled me to acquire. I have been the more reluctant to enter upon this task from the knowledge of my inability to treat the subject from those points of view which will be of special interest to the gallant members of this Society, and I can only hope that though this may be the case there may be found in its novelty what may, in some degree, compensate for other deficiencies; and that if I fail to do more I may succeed in provoking enquiry that may lead to the desired result.

In endeavouring to draw your attention to the subject of my lecture, I desire at the outset to say that I wish throughout to convey such information as may bear upon what I consider will be the prominent question in the future history of that country, viz., that of our rela-

tions with the natives, and the responsibilities which are involved in the extension of British dominion that has now taken place.

It will be well known to many that prior to the annexation of the Transvaal and of Griqualand West, the native border abutting on the British possessions in South Africa was limited to that adjacent to the eastern province of the Cape Colony where the war is now occurring, and to the northern and southern boundaries of Natal. Of the first it may, I trust, be said, that the present campaign will finally end all serious difficulty in that quarter, and of the latter that it is from the northern boundary alone that future trouble need be apprehended, the Zulus being naturally a warlike and aggressive people, while those on the south, the Amapondas, live in an exposed country, are more peaceably inclined, and are too much hemmed in by the adjacent British colonies to render them a source of much danger.

The Zulu nation need also have afforded no occasion for much fear, for they, too, were in an enclosure which laid them open to attack from all sides—Natal on the south; the Transvaal and their hereditary enemies, the Amaswazi, on the west; the Portuguese settlement with their enforced tributaries under Nozingele, on the north, and the Indian Ocean on the east. Thus surrounded, and with rival claimants to the throne within the dominion, the Zulu King Cetewayo has known but too well hitherto what the result of offence on his part would be to venture upon disturbance. Recent events may, perhaps, have tended to change his position in some respects; but of this, as well as of the measures necessary to restore the previous status, an estimate may, perhaps, be formed as I proceed.

But by the annexation of the Transvaal, and of the Diamond Fields or Griqualand West, we have now, besides absorbing an enormous native population, acquired a territory with an exposed border of from 1,200 to 1,400 miles in length, the country adjacent to which is in the occupation of native tribes.

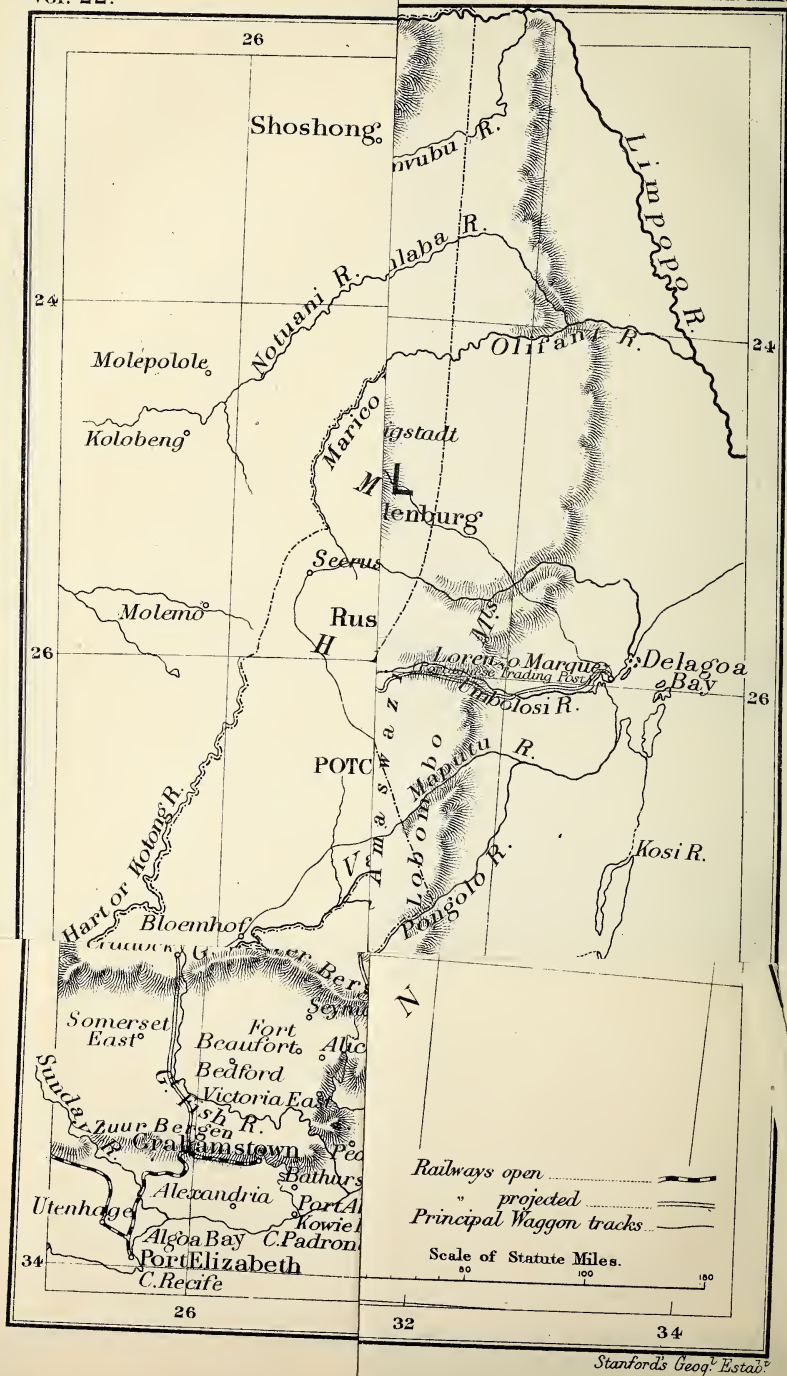
The importance of this point cannot, I think, be over-rated, for the questions which may in future arise from it admit of infinite radiation, and, if the past history of the Cape frontier be taken as a guide, may assume a character which will specially affect those to whom the protection of British interests are more immediately confided. It would, therefore, be well that in this early stage of the country's history, and in initiating measures for its future government and defence which are intended to be permanent, every consideration should be given to it.

I propose, after giving a short sketch of the past history of the Transvaal, to speak of the population, viz., Dutch Boers, the Europeans, and the natives, alluding, by the way, to the questions which may occur to me as incidental to each, and to conclude with remarks upon native policy, and the future government of the country.

The Transvaal, or what was formerly known as the South African Republic, is situated between the 22nd and 28th parallels of south latitude, to the north-west of and adjoining the colony of Natal, and is separated from the Indian Ocean on the east by the Portuguese settlement of Delagoa Bay, and the country of the Zulus. In size it is



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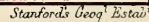


approximately equal to the combined area of Great Britain and Ireland, or about 120,000 square miles, and contains a population which is widely estimated at from 300,000 to 1,000,000 souls. Of these about 30,000 to 35,000 are Boers, or South African farmers of Dutch extraction, 5,000 English or other Europeans, and the remaining large proportion native blacks.

It was originally colonized by the Boers, who, being dissatisfied with British rule at the Cape, had, from time to time, pushed on from thence towards the interior. It was in or about 1835 that a more organized movement took place, which in the end led to the occupation of what is now called the Orange Free State and of Natal; and it was while settling down in what was then an unoccupied tract near the northern border of the former country, that they aroused the fear or the jealousy of the neighbouring potentate Moselikatse, who, crossing the Vaal River from the north, attacked them unawares and murdered a considerable number of their party, carrying off at the same time large numbers of their cattle and some of their children. In resenting this unprovoked attack, the Boers in the following year gained a complete victory over this chief, who with his people then fled beyond the Limpopo, and established themselves in the country between that river and the Zambezi, where they have since then continued to reside. By right of this conquest the Boers claimed and exercised dominion over all the territory which had previously been under the rule of Moselikatse, and which may be generally taken to include the tract lying between the Limpopo and the Vaal Rivers. After securing the submission of the few tributary chieftains who remained behind, and who had long suffered from the inhumanity of the expelled tyrant, they then entered into occupation and set about establishing a Republican form of Government, in accordance with a patriarchal system of their own. For many years after this their position as an independent and self-governing people remained unrecognised by England, who looked upon them only as so many filibusters or renegade British subjects; but in 1852 Kafir wars at the Cape, and complications in home politics, seem to have produced a change in public feeling with regard to them. Owing to these causes philanthropic sentiment, which is somewhat liable to abnormal accumulation during long periods of repose, was for a time withdrawn, and a reaction having set in, the resolution was arrived at in England in that year to reverse the previous policy, and to acknowledge the independence of the Boers.

A Convention was accordingly entered into between the British Commissioners, Messrs. Hogge and Owen, and the Boer Representatives, by which that independence was formally guaranteed, and in which, as if with the object of more distinctly affirming the changed views in regard to native policy, a clause was introduced disclaiming, on the part of the British Government, all intention of interference thenceforward in native matters north of the Vaal. No definite boundaries were in this deed assigned to the Republican territory, except with regard to the southern border, which separated it from the Orange River Settlement, an omission which left the inference open that, to the north and in other directions, the Boers would be





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allowed, as far as England was concerned, absolute liberty of range. This inference, at least, they were not slow in adopting, for, acting upon the rights thus assumed, and in the belief that the promise of non-intervention would be kept, a proclamation was at one time issued, declaring the northern border to extend as far as Lake N'Gami; but a protest against this extension having been lodged by the Cape Government, the effect has been to reduce the actual exercise of jurisdiction to the limits which, by common consent, had been accepted as the boundary of the country.

These, as I have before said, may be taken to embrace the territory bounded north-west and north by the Limpopo, and south by the Vaal River. Additions to the east were subsequently made, by treaty or purchase, from the Zulu and Amaswasi kings, and, on the south-west, a tract was also obtained as compensation for losses occasioned by war; but, with regard to these latter, disputes have arisen which have not yet been determined, and which now await a settlement under the auspices of the British Government.

From this description it will be seen that the Transvaal occupies an entirely inland position, the Portuguese territory intervening between it and the nearest harbour at Delagoa Bay. It is at the present time dependent for its communication with the coast upon the distant and difficult route by Natal, through which all produce and merchandize have to be carried by the tedious and expensive process of transport by oxen. It is by this route, also, that the troops, with their baggage and artillery-trains, have at present to travel, when proceeding to the country.

The natural port of the Transvaal is, however, that of Delagoa Bay. It is the only safe harbour between this part and Simon's Bay, and in this respect has, of course, immense advantages over the open roadstead and unapproachable bar of Natal. Its position, too, is opposite a central part of the country, and at a moderate distance, as compared to the other, while, for the purposes of railway construction, the superiority of this line over that from Natal is beyond all dispute. Hitherto, the existence of the tsetse fly, which is destructive to domesticated cattle, upon a portion of this route has militated against the opening of traffic—a difficulty which it is to be hoped will ere long be overcome by the more pachydermatous motive power of the railway engine. An objection has been raised to the opening of this route, as being prejudicial to the interests of Natal, and as tending to benefit a foreign possession, but it is to be hoped that so narrow a view will not ultimately be allowed to prevail. There is a very laudable and patriotic feeling which pervades a certain portion of the colonists of Natal, and which would seem to indicate an opinion, if not that the world was created for its special benefit, at the least that the interests of the Transvaal should be made to give way to its own, and that, in spite of the superior advantages offered by the Delagoa Bay route, the railway should be carried through the territory, and to its port of Natal; but as this would involve a sacrifice of almost vital import to the Transvaal, the latter may perhaps be excused from holding a somewhat different view. From the inland position of the country,



the question of railway communication as a means for developing its internal resources is not one which can admit of doubt or discussion. It is in this case one of imperative necessity, both to enable it to support an independent existence and to provide for its defence.

A large portion of the Transvaal lies at an elevation of from 4,000 to 6,000 feet above the sea, rising to its greatest height along the Drakensberg range, where the peaks reach to 7,000 or 8,000 feet. With these great differences in altitude there are, as will easily be conceived, corresponding varieties of temperature, the more elevated parts being cold and bracing, and the lower levels, again, quite tropical. On the whole, it may be said that the climate is exceedingly healthy, and also that it is a country in which the European race will not suffer deterioration from climatic influences.

Owing to the differences in temperature at its successive elevations, the Transvaal is also capable of a great variety of animal and vegetable production. Horned cattle and horses, as well as sheep and goats, are reared with success in different parts. Cereals of all kinds, tobacco, vegetables, and almost every variety of fruit thrive remarkably well, and sugar and coffee, though not as yet extensively grown, promise to become lucrative articles of export.

Of minerals, too, the country has a plentiful store. Coal, of good quality and near the surface, is found over an area of 10,000 square miles, at a moderate distance from the coast, and on the line of the projected railway. Iron, also, exists in great quantities, mines of hæmatite, of good quality, having for years past been worked by the natives, while in the north there are actual mountains of magnetic ore. Lead and copper are also found in various parts, both associated with each other and apart, the former being now successfully worked at Marico, and mines of considerable depth affording proof of the latter material having been excavated by natives in times past. Diamonds at the south-western and gold in the north and north-east parts of the country have also been discovered, though not as yet in any very large quantity, and a cobalt mine, near Middelburg, has lately been opened, and it is said is proving a profitable speculation to the proprietors.

Owing to the heavy cost of land carriage, there are, however, few of these products that can be made available for export until improved means of transport have been provided. At the present time the staple articles of commerce are confined to such as, from their value, will bear these heavy payments, such as wool, hides, ivory, ostrich feathers, and cobalt.

It will be seen, from what I have said, that the Transvaal has within itself all that is required to make it a self-sustaining State. It is admirably watered over the greater part; the climate is good, and the seasons regular—the rains falling, as a rule, during the summer from October to April, and the winter months being generally dry.

A great portion of the country, and especially that at the higher levels, is, owing to its plentiful water supply and the quality of its soil, capable of supporting a large population, and thus affords a prospect of its being utilized, in course of time, as a field for emigration. The neighbourhood of New Scotland, in particular, with all the high

table-land along the water-shed, from Leydenburg, on the one side, to Wakkerstroom on the other, and, with the slopes leading east and west from that line, is specially adapted for English settlement. The greater part of it lies at an elevation of from 5,000 to 6,000 feet above the sea, dropping rather abruptly towards the coast, and inclining very gradually again towards the interior. At the summit it forms a great woodless plain, with lakes, some of fresh and others of brackish water, and of sizes varying from half a mile to ten miles in length. The absence of wood, however, is compensated in some measure by the coal which is found all over this region, and which is of very superior quality. Unfortunately, the land throughout the Transvaal is almost all held by private owners, and thus the Government will be unable to organize any extensive emigration, or provide for other public objects, as is done to other colonies through this means. The emigrant will therefore have to resort to private purchase in order to obtain his land, but for this, owing to the very large amount in the market consequent on over-speculation, there is every advantage in his favour, the present prices ruling far lower than are to be found in any other colony. Any systematic emigration, however, must depend upon the line of railway being constructed, as without a prospect of easy communication with foreign markets, there would be little hope of success in farming.

The Government of the Transvaal has, until the last year, been carried on under a Republican form, and virtually controlled by the Dutch emigrant farmers, or Boers, whose numbers, as I have before said, are about 35,000, and who thus stand in the proportion of seven to one of the rest of the white population. Owing in part to defects in the Constitution or the fundamental law of the country, to their want of education, and of acquaintance with the principles of political economy, but perhaps, most of all, to the absence of a competent leader, the administration of the country has for many years past been declining in efficiency, the result of which has been to bring it to the extremity which has ended in its collapse, and has made annexation, if not a necessity, at least a matter of easy accomplishment.

But it has had other and perhaps greater difficulties to contend with. Small in their numbers, compared to the mass of barbarism by which they have been surrounded, the energies of the people have been withdrawn from legitimate industry, and have had to be directed mainly to maintaining their authority over the black population, which has been surging in since their occupation of the country. With no other means of raising a revenue than from internal sources, and subject, not alone to a charge of from 10*l.* to 20*l.* a ton for the transport of all articles of foreign merchandize, but also saddled with the payment of heavy Customs dues to the Cape and Natal for which they got no return, it has been impossible for them to provide the means of carrying on an effective Government. On the other hand, every trifling lapse of justice or act of irregularity, though in general only the result of their weakness, has been visited on them in a manner to still further paralyze their efforts, and to strengthen the hands of their adversaries.

But notwithstanding these almost insurmountable drawbacks, a

steady advance, not alone in material prosperity, but also in civilization, was taking place. The old animosity against the English, dying out as the causes of irritation were forgotten or removed, the latter were gradually received into their counsels, and influencing their Government; and the time was being looked forward to when, with mutual goodwill and by a more natural transition, the change which has now taken place might have been effected. This result, it was also hoped, would have been materially hastened by the opportune discoveries, which caused an immense influx of British subjects from the Cape and elsewhere to the diamond fields, a portion of which were within this territory. It was felt that it was only by English migration that the population could be materially augmented, and thus that the question of the change was only one of time, and that, if left to the natural action of self-interest, the desired solution would follow in due course. To those similarly situated to myself, who were living in the country, and had every desire to promote its interests, the possession of the diamond fields was looked upon more as a burden than as a valuable acquisition; and if the population could have been separated from the glittering stones they would have gladly sacrificed the latter. But it was the population they wanted, and these were doomed to be withdrawn, and a policy entered on which has been the chief cause of all subsequent trouble.

The first effect upon the Government of the Transvaal of the measures then adopted by the English Colonial authorities in South Africa, and which resulted in the annexation of the diamond fields, apart from the distrust and aversion to the English which it revived or stimulated among the Dutch inhabitants, was that of weakening its authority over, not alone those whose cause had been espoused in order to sustain the claim to the land, but over the whole body of the native population within and adjoining the State. And this was not all, for at the same time firearms, which by Treaty with us the Boers were prohibited from selling to the natives, were here thrown open to the latter to an unlimited extent, and it is estimated that in a comparatively short period upwards of 200,000 guns were purchased by the natives living at the northern and western borders of the Transvaal. Earnest appeals and protests were made, but with no effect. The colonial revenues were profiting by it to the extent of 10*s.* to 1*l.* a barrel; and the guns costing in Birmingham 4*s.* to 5*s.*, selling at 6*l.* to 7*l.* 10*s.* each. It was perhaps natural that at the time those reaping so large a profit, and who were unaffected by the consequences, should raise no objection, and be deaf to appeal, but an estimate of the feelings of the Transvaal residents on the occasion may be formed by referring to the following extract from a Natal newspaper of late date, and written since the threatening aspect of affairs on their border have made the question of the sale of firearms to natives one of close personal interest to that colony. The editor says:—"We cannot find words sufficiently strong to denounce the wicked cupidity of the Europeans who can be so lost to all sense of right and patriotic feeling as to take part in or connive at such a traffic. We do not hesitate to say that any man who is privy to such transactions, or



“ who directly or indirectly knowingly shares in the profit is guilty of criminality of the deepest dye. Were their guilt to become known it would be the duty of the whole community to shun and execrate them.” On this I will only remark that it can hardly be a matter of surprise, at least to the Natal editor, that the Boers should now shun, if not execrate us.

The troubles of their Government did not end here, for before the excitement and irritation which had been caused by these measures had had time to subside, further difficulties arose in the north. Thefts of cattle having taken place, and the delinquents being harboured by the chief Sekukuni, it became necessary to declare war against the latter, and here again for some inscrutable reason the cause of the savage is espoused—the war declared unjust and aggressive—and the chief to have the rights of a belligerent, British subjects residing in the Transvaal being at the same time prohibited by proclamation from taking part against him. This injunction, however, did not, I am happy to say, have the effect of deterring Englishmen from doing their duty there, as elsewhere, but by the moral support it afforded to the rebel chief it inflicted another severe blow on the country. These were some of the chief causes which led to the disorganized state of the Transvaal, in which it was found on the arrival of Sir Theophilus Shepstone at the commencement of last year. But there were other circumstances which also greatly influenced this position. The war with Sekukuni had been entered on without preparation, and on a far larger scale than is suited to the patriarchal Boer system. Without any knowledge of military matters, the President had constituted himself chief, and had taken personal command of the expedition; and after many months of fighting found himself not alone unable to penetrate the almost impregnable natural fortresses in which the chief protected himself, but also reduced to great scarcity both of food and ammunition. In almost absolute want, or receiving uncertain supplies of these necessities, it was but natural that in the end confidence in him should fail. Disaffection thus soon showed itself, and before long open defiance.

As the summer season was now about setting in, bringing with it the annual horse distemper, the volunteer army summarily dispersed and retired to their homes, arranging among themselves to return before the following harvest, when the native crops, which were grown on the plains, would be exposed to capture; and thus that though unable to follow their enemy into the caves, they would endeavour to defeat them by starvation. This movement on their part was at once taken up and commented on by adverse newspaper and other correspondents, who not alone magnified it into a defeat, but also falsely represented that Sekukuni was in full pursuit of the flying army to Pretoria. This was also the tenor of the misleading telegrams to England, which to all appearance were the immediate occasion of Sir Theophilus Shepstone's mission.

The President's term of office having also now nearly expired, and a new election being about to take place, the country had, in addition to its other complications, then to decide on the choice of a successor; a

matter upon which the people were on this occasion more than commonly divided. It was at this particular juncture that the British Commissioner, leaving a large body of troops near the border, entered the country and took up his residence at the seat of Government. Meanwhile rumours were in circulation, that peaceably if possible, but if necessary by force, annexation was intended. The English or European inhabitants who preponderate in the towns flew to the standard, and the President himself offering no rallying point, opposition was disarmed and annexation became easy. The apparent apathy or indifference of the Boers on the occasion of this singular assumption of their Government by a foreign power is thus to some extent explained. They had been taken at a disadvantage, the imminence of the dangers that surrounded them exaggerated and dwelt on until they themselves seemed almost to believe in their reality, and in the end they surrendered to what they were told was "the inevitable."

At the crisis considerable anxiety was felt as to the result, and much fear was entertained that hostility with the Boers would be provoked; the relief was therefore also much appreciated at the peaceful termination of the proceeding, and great credit was given to the Commissioner for the management he had displayed; while those who regretted the necessity or condemned the policy of his action seemed too thankful to allow themselves to hamper him with futile expressions of dissent.

In endeavouring to convey an account of the causes which led to the annexation, and the manner in which it was carried out, it has not been my object to dwell upon the grievances of the Boers more than is necessary to enable us to form an opinion as to the feelings which they, who constitute the great majority of the white population, may be expected to entertain towards us, and as to the measures, if any, which it is necessary to take in order to induce their harmonious co-operation with us for the future. And I have also desired to take this opportunity of protesting against the habit of looking upon the annexation of the Transvaal only with feelings of gratulation or pride,—and referring to a sturdy Englishman and twenty-five policemen having effected this object without so much as saying, "By your leave,"—and not taking into consideration what were the causes that led to the weakness and demoralization of the Boer Government, or what the responsibilities which have now been undertaken by our own.

A deal of obloquy has been thrown upon the Boers, emanating chiefly from those who were endeavouring to bring about the fall of the Republic. Speculators who hoped by the substitution of British rule that their lands would rise in value, besides a large portion of the colonial press and others, were engaged in systematic misrepresentation to bring about the desired end. Even in the published blue books on the subject, we find pages taken up with anonymous letters and newspaper articles giving exaggerated accounts of the defencelessness and distress of the white population, and at the same time, with palpable inconsistency, of their tyranny and oppression of the blacks. A long correspondence also appears on the subject of the use of explosive bullets, and of the massacre of women by the Boers; and notwithstanding the refutation of these charges, and the entire absence

of evidence to support them, the stigma has most ungenerously been allowed to remain.

But the Boers are not all the monsters they have by some been represented. Fortunately for them, their country has of late been visited by two eminent writers, who both bear testimony, without disguising the harsher features in their character, to those that do them credit, and both tend to show that whatever their defects may be, they are but the result of the circumstances which for generations have controlled their lives; and also that these are, to say the least, no greater than characterize those who have been similarly placed in other lands. It is my own feeling that instead of condemning them, as is often done, for faults which owe their origin chiefly to their long isolation, they should have every praise for having kept themselves as free as they have done from the contaminating savage influences which have for so long surrounded them, and that Englishmen at least should not forget in how far they may be due to the effects of British rule or British neglect.

Having now occupied so much time in treating of the Boers, a few words will, perhaps, suffice to allude to the remaining portion of the white population. These have been estimated at about 5,000, and are composed chiefly of home and colonial born British subjects, with a few Dutch, German, and other foreigners. This body, though small, exercised considerable influence under the late Republic, owing to their generally superior education and progressive tendencies. It is from their ranks that, as a rule, all departmental offices of Government have been filled, and by them that the trade of the country is chiefly carried on. They had also of late been elected in increasing proportion as members of the Legislature, the Boers preferring as much as could be to devote their attention to their own more congenial pursuits, and thus the former were gradually acquiring an important control over the affairs of the State.

The native population has always been estimated at from 250,000 to 300,000, though in the reports of the present Administrator I find that he considers the number who are legally subjects of the State, and which I conclude must be taken to mean those who live within its acknowledged limits, to be no less than 800,000. No census, however, has at any time been taken, nor do even any approximately accurate data exist, as far as I am aware, for calculating them; the first-mentioned estimate of about 300,000 being, I believe, the result of guess-work of missionaries and travellers. Upon what the later calculation has been based I have no means of ascertaining, and though I should have thought this estimate excessive, yet the position of Sir T. Shepstone entitles his opinion to much weight. The native population, however, whatever its numbers may be, consists of various small tribes, the great majority of whom occupy the country near the northern and western borders. As has been the case in Natal and the Orange Free State, the security to life and property derived from the presence of the whites has caused a vast accession to the black population by migration from the countries exterior and adjacent to it. In Natal the British Commissioner, who was sent up to annex on that



occasion, reported the number of natives in 1843 to be about 10,000. It has since then, under British rule, advanced to upwards of 300,000. In the Orange Free State, Moshesh was, in 1840, an insignificant chieftain with a small following, and glad to shelter himself under the Boers, though but a few years later he was able to defy the British troops, and afterwards to cause infinite annoyance to those under whose protection he had gained wealth and strength. So also in the Transvaal. When Moselikatse fled before the Boers in 1836, he left the country almost denuded of inhabitants. The father of Sekukuni had previously been driven out of his fastnesses by him, and the remaining small tribes who had been the dogs or slaves of the great chief, were glad to acknowledge their subjection to, and accept the protection of, the Boers. Gradually, however, by the return of individuals to existing tribes, as well as of whole clans who had been expelled by Moselikatse, these also have gained in strength. Of the latter, the Chief Sekukuni occupies perhaps the position of most prominence, as fortified by the natural strongholds to which he had returned, and by the possession of firearms before alluded to; it was the war with him which was the immediate cause of the collapse of the Republic, and it is he who is now occasioning alarm to the present rulers of the country. The natives of the Transvaal, though forming a large aggregate, are more divided into separate nationalities than in Natal or near the Cape; and for this reason they do not constitute so great an element of danger. To keep them thus separate, and to avoid giving rise to combinations either from motives of political interest, or for the purposes of war, will, it is to be hoped, be the endeavour of the present Government, as it is only by this means that in the absence of a large military force, or until the white population is greatly increased, we can look forward to any permanent peace. Large masses of natives, as they are found in South Africa, have always been a serious bar to the progress of the colonies they inhabit or adjoin. It is not only their savage restlessness and their proneness to war, by which such colonies are periodically thrown back so many years, as to leave them practically at a stand-still, that constitutes their disadvantage, but it is that their presence always necessitates a heavy increase in expenditure, for which they cannot or do not pay their due share; and that owing to their idleness they do not form an element of wealth as a European population would do. Of the natives of the Transvaal, however, it may be said that they are less warlike and thus less a source of danger, and have in themselves more aptitude for civilization, than any of the tribes in and adjacent to Natal or the Cape. They are more ingenious, imitative, and progressive than is the Zulu; though, on the other hand, perhaps more openly untruthful, and flagrantly dishonest; and, in short, there is in these respects but little fear of their suffering much from the contagion of civilization. They also show a greater desire to accept Christian teaching than do any of the other native tribes; and it is a singular fact, and one well worthy of being noted, that notwithstanding the well-known opposition of the Boers to missionaries, it is only among the natives here, or those on the western border, that Christianity is tribally professed, and that a

desire is shown to adopt European clothing and habits. The Boer has a contempt for the heathen worthy of the Israelite of old; he almost denies him the possession of a soul, and tells him that the skin he wears is too good to cover him, and yet whether it is owing to his spirit of contradiction—to his imitative nature—or whatever the cause may be, it is among these alone, of all the South African tribes, that the native encourages and supports the missionary, and with the creed affects the clothing, habits, and even language of his civilized invader. In the English colonies we have to make laws to compel the natives to cover their nakedness on entering the towns; we offer every encouragement to missionaries, who on their part lay before them every kind of inducement to take up the profession of religion, and we only succeed in repelling them. The natives seem to suspect a sinister design when such persistent efforts are used to make them accept what they are at the same time told it is a privilege to have, when, in fact, it is made too cheap to them. And here I would ask whether it is not, perhaps, in this very fact that much of the evil lies which has brought about the disrepute so often attached to missions, and to their so-called converts. That the latter, as a class, do not enjoy a good name cannot be denied; with the Boers the dislike to them is universal, and the English colonist also points to the rebellions that have had their rise among them, to the gaol returns, and to the open immorality at their stations. It is, however, a tender subject to speak upon, as Lieutenant Cameron found to his cost at the meeting of the Geographical Society; but it will not do always to evade the question, for there is certainly something radically wrong, both in this and as regards our system of dealing with black races generally; and if we wish to ascertain where the evil lies, or what the remedy, we should not, as was done in his case, content ourselves with flat denial.

Baron Hubner, in his “Promenade Autour du Monde,” after passing a high eulogy on the English as colonizers, bears strong testimony to their failure as compared to the Spaniards and Portuguese, if, as he says, colonization means carrying civilization into the heart of a native population. “Wherever the Spaniards have reigned,” he says, “we find Indian tribes who have embraced Christianity, and adopted in a measure our habits and ideas. The greater part of the politicians whom we see at the head of the Republics are of Indian origin. I have had pure red-skins as colleagues, and I have seen ladies of the same colour dressed by Worth delighting in Patti’s *roulades*. I do not quote these personages as models of statesmen, or these fair critics as great authorities in music, but the fact is none the less significant. Well, this is the work of Spanish colonization. Can we say the same of the effect of English emigration? Evidently not. I set aside all question of India, which I have not yet visited. But everywhere, especially in North America, the contact of the Anglo-Saxon race with semi-barbarous savages is fatal to the latter. They only adopt European vices; they hate and fly from us, and that is the wisest thing they can do, or else they perish miserably. In every way they remain what they have always been—savages.”

In South Africa, or rather in Natal, it has not been the case that they have perished miserably—they have too much vitality for that—but though they have not done so, we have everywhere failed to make contented subjects of them, or materially to improve their condition. In the Portuguese settlements in Africa, that I have seen, the European seems to be welcome to the savage. They work along happily together, and civilization diffuses itself among them, it may be slowly, but yet by an apparently easy and natural process, and without any of those shocks which occur with us. So also with religion. They do not proselytise and preach as we do, nor do they offer material inducements in any shape, but their church door is open, and they are ready and willing to teach when required. The result is that their chapels are full, and that, when they do make a convert, he is a sincere one.

On the other hand, the system which has prevailed at many of our missions is one that could not but be productive of much evil. By allowing the free use of land on the stations as the reward, so to say, of church attendance, the effect has been to encourage, not alone idleness, but hypocrisy. While, by debarring them from acquiring an interest in the soil, through the possession of landed property, and, by keeping them as tenants-at-will, and thus in a state of dependence or virtual vagabondage, the result has been but too often to make of them discontented and rebellious subjects.

Another evil connected with large mission stations as they have existed, as well among the native tribes as in the civilized parts of South Africa, is that of the segregation of a class in the community. Separated in feeling, as well as in position, from their non-professing brethren, and, in general, assuming to be their superiors, they acquire separate interests, and, by their numbers as well as their unity, become a source of danger. The missionary, too, in such cases, in his joint capacity of proprietor and priest, obtains over the people, and through them in the State, an amount of influence which, as has been proved in times past, is liable to much abuse. Other circumstances may also affect the character of different missionary stations, and which arise from the mode of teaching or, it may be, of the doctrines taught, for at the one you will meet an honest cheery-looking lot, who are glad to see you and will salute you with respect, and, at the other, a sullen scoundrel, who seems at once to put himself on the defensive, lest you should be deceived into thinking you were as good as he; but of these matters it would not do to say too much. What I have mentioned are however, I believe, some of the chief causes of the unpopularity and disrepute in which missions have been held, and which have excited the distrust and jealousy of the civilized man, as well as of the savage.

The Transvaal, with the population such as I have described, and with inherent wealth to entitle it to rank as a valuable possession, has now passed into a British dependency, and it is with these materials that the foundation has to be laid for the establishment of a Government, and by them that its future destiny will be controlled. The questions as to the form of government that is to be introduced,



and as to the means by which this new acquisition is to be utilised and the country to be made self-supporting, are, I have no doubt, engaging the attention of those in authority, but I confess to being somewhat sceptical as to their receiving an early or a satisfactory solution. If the Boers, who form seven-eighths of the white population, should continue, as I trust may not be the case, to maintain their present attitude of passive resistance, it would, of course, be folly to suppose that there can be any continuance of the self-governing powers that prevailed prior to the annexation; and thus that, unless some measure is devised for securing their good-will and co-operation, there will be no other alternative than that the responsibility of its government should fall upon the Crown alone. This, however, is an issue which is at variance with the promises made on taking over the country, and I should therefore think has not hitherto been contemplated or provided for by those concerned in the annexation; neither, I imagine, was it anticipated that the new colony should for long remain a burden on the home country, either for its administration or defence.

It may naturally be expected that after having so far made a display of all that seems adverse to a solution, I should myself be prepared to indicate a line of action by which the difficulties could be met, and the various interests in some degree united. But without a knowledge of the ultimate views which have dictated the policy thus far, or of the means available for carrying them into effect, it is impossible for me to do more than touch upon such matters as to myself may appear important, though they may in effect be but superficial as regarded from another stand-point.

Before going into the consideration of the question I have here mooted, namely, that of the means by which harmonious co-operation among the white inhabitants is likely to be promoted, I think it is necessary first to enquire as to another which is of equal, if not prior, importance—that of revenue.

One of the chief difficulties of the Transvaal has hitherto been that of obtaining a revenue sufficient to provide the machinery necessary for its effective government and defence, arising from the absence of that which in most countries is the chief source of supply, viz., Customs duties; and this difficulty must inevitably continue until such time as the white population is increased, and its mineral and agricultural resources can be utilised, or until taxation of the native population can be enforced. At the present time, without markets for their produce, and having to pay heavy Customs dues, which are expended for the benefit of the neighbouring colonies, it is impossible to expect that a population numbering at the utmost 10,000 adult men can provide the means, not only for their own personal government, but for the control of 800,000 blacks, and for the defence of a border of 1,200 miles.

This great want may in some measure be met by requiring the Cape and Natal to refund the proportion of Customs duties obtained from imports destined for the Transvaal; but this is a concession which has hitherto been resolutely denied, and even should it be eventually obtained through Imperial pressure, considerable time must elapse

before it can be made available. The expenditure of the country, on the other hand, has also now materially increased, owing, not alone to the military occupation which has become requisite, but also to the necessarily extended machinery of government required by British rule. Formerly many services were performed gratuitously, such as apprehension of criminals, police duty, &c., but this system being liable to abuse either has been, or soon will be, discontinued. The late Government being limited in credit, as well as in means, were bound to cut their coat according to their cloth; and a necessary consequence of this poverty has been that crime often remained unpunished, and that irregularities occurred on its distant borders, and collision with natives which have from time to time brought upon them the thunders of Exeter Hall. As an instance of this I may mention that I recollect on one occasion the Government being goaded into an expenditure of 2,000*l.*, or what was then one-tenth of the annual revenue, on a single prosecution, in order to satisfy the demands made by the Colonial Office under the influence of such pressure. But it is unnecessary to go into further detail, for from what I have shown I think it will be sufficiently evident that if the defects of the previous Government are to be remedied, and the peace of the country permanently secured, it must be by the exercise of Imperial authority and with Imperial means.

Before reverting to the subject of the Boers, I wish to draw attention to some matters involved in the act of annexation itself.

The main or ostensible object of that measure—setting aside the under-current of pressure brought to bear on the public mind by the Humanitarian Societies at home—has been to secure the peace of that and our adjoining colonies, and has, I conclude, been based to some extent on the assumption that “the reputation of British rule stands high with all the tribes, and that they would hail its introduction as a positive blessing;” and to quote further from the same despatch, written prior to the annexation, “that we have paramount influence with the most warlike of the native powers outside the Transvaal boundary, and that the position of the two most likely to give trouble—the Zulus and the Amaswazi—is such that the possession of the Transvaal by Her Majesty’s Government would at any moment checkmate them both.”

Now, I say in regard to the first that the reputation of British power may stand high, though I do not admit that its *rule* does so; but I argue from the very fact of the higher estimation in which its power is held, that the Zulus and other tribes, finding themselves thus surrounded, would have greater cause of apprehension, and thus be far more likely to make a common stand than when confronted with a power they did not so much fear. And, on the other hand, I cannot see that the control we would have over the Zulu nation (for the Amaswazi, being old enemies of the latter, cannot be classed with them here) would be insured by indefinitely extending the line requiring protection. The past history of the Cape does, at all events, not tend to encourage the belief that the predictions here held out would be verified. Facts are, however, now taking the place of surmise and argument, for we find that both the Zulu King and the Chief Seku-

kuni are assuming to-day towards us the same attitude which they had previously taken up towards the Government of the Republic. The course which events appear now to be taking show in fact only a repetition of the story told by Sir George Clerk, and which I quote from a very able article in the *Quarterly Review* for January, 1877, on British policy in South Africa. Writing as High Commissioner from the Cape in 1854 on the "motives and history of the successive acts " of territorial extension in that colony," Sir George says: "One of " the reasons for extending British dominion in South Africa has been " to prevent the extinction of the rights of the natives. The know- " ledge that the British dominion has been thus enlarged proves " acceptable in England. The extension manifests our power, the " motives our benevolence. After a while the measure becomes costly. " Enquiry follows; and then it is evident that the conquest has been " the mere occupation of wastes, almost uninhabitable, attended with " constant inconvenience and dangers to the State, arising from " nothing less than the extinction of the rights of the natives, to " protect whom was the pretext of the extension of our authority."

When these native rights, whatever the expression may be taken to mean, were lately placed in antagonism to those of the Boers—the latter tried on their part, but unfortunately have failed to extinguish them. We have now succeeded in effacing those Boers' rights, and everyone who is not disloyal must now devoutly hope that the brave men who are serving their Queen out there will enable us to repeat the operation upon the Chief Sekukuni, and, if necessary, upon the Zulu King also, "to protect whom" (if I may be excused the repetition) "has been one of the pretexts of the extension of our authority."

I now return to the question as to the mode in which the mixed population is to be governed, and how their interests are to be reconciled to our rule, which to use plainer language means, is it necessary, and if so, what is it advisable to do in order to lead the Boers to abandon their present sullen attitude, and to accept, in the spirit in which it has been meant, from England at least, the hand which has been held out to them? From what I have said at the commencement it will be seen that the grievances of the Boers are of old standing. To quote again from the article I have before mentioned, Sir George Clerk, writing to the Duke of Newcastle in 1853, says: "Your " Grace is no doubt aware that in reviewing the former policy of the " British Government one cannot escape from the painful conviction, " with reference to the interests and feelings of the Dutch inhabitants " of the Cape Colony, that the measures which, with few exceptions, " it has pursued towards them, and the neglect or disdain with which " it has habitually regarded them, have engendered a spirit which " leaves them by no means desirous of remaining under British " dominion." I have mentioned what has taken place with regard to them subsequently to that time, and I think it will be admitted that since to that neglect or disdain have been added the overt action I have attempted to describe, it cannot be expected that their feelings towards us will have improved in the interval.

But notwithstanding the strong reasons we have given them for



their aversion to our rule, I do not by any means despair of their being brought round to a better feeling, provided the desire is properly manifested on our part. The Boers are, as Mr. Trollope remarks, a grateful people—often indeed thankful for very small mercies. The slightest attention or civility on the part of those in authority is keenly appreciated, and when it occurs, becomes a theme of continual praise. So also on any of those occasions that any act of otherwise than supercilious kindness or sympathy has been performed towards them by a neighbouring colony or Government; and, in spite of all that has happened, there still lingers with them the conviction that England's Government and England's Queen are great and good. But what has in the past, and does still rankle in their hearts, are the acts of injustice or contempt from which they have suffered—at the instigation of, it may be, a colonial official—or of a pseudo-philanthropist at home. The manner in which Lord Carnarvon's general colonial policy has been received by them is an instance of this, for their appreciation of his sympathy, and of his efforts to harmonise the different provincial interests in South Africa, has been sufficient to sustain their feeling of admiration and respect for his person in spite of their aversion to the measures he had of late been led to adopt with regard to them personally. The main point of difference between the Boers and the Government of England as it has hitherto been administered in South Africa, and one upon which they have the sympathy in a great degree of their English fellow colonists, is that of native management. It is the question that has been at the root of all their discontent, which drove them from the Cape, afterwards from Natal, and now has brought about their political collapse. But here I apprehend there will be some difficulty in obtaining a practical or a dispassionate consideration of the matter—for it is also one upon which those who are totally unaffected by its results, except as a matter of sentiment—will claim to have a voice in the decision. Past experience has shown that a colonial question of this nature—unless it involved a point of home interest—would in all probability, when brought before Parliament, have the effect either of clearing the House, or it would be controlled by those who have constituted themselves the champions of savagedom, and whose proceedings in this respect have caused more hostility between the races and more permanent injury to blacks than I think can be traced to any other special cause. It is therefore much to be feared that the definite settlement of the question will not be arrived at until those most concerned in its effects are in a position to act independently of such control.

The first and most essential point to be determined is as to whether we have any right in the country of the savage at all; and it is one upon which, though practically decided long ago, there is still a want of absolute concurrence of opinion. In taking possession of such land we have, as if it were with the desire of avoiding the admission of an apparent injustice, always tacked on a high and beneficent motive, conveying, it may be said, the further admission that, but for that motive, the act would be unjustifiable. In a similar course, one by

one, each native right is extinguished, but always again with a preamble in which the motive excuses the act. Now the Boer arrives at exactly the same result, but by a much straighter cut—or, I should rather say, he commences about where we end—which is in saying that when they meet, the savage has to go to the wall, that is, that the right of the latter to govern, and *his* right to the soil, ceases or becomes subordinated to the will of the superior. It may be that, after this stage, we can lay claim to rule with greater lenity, or what it pleases us to call justice; but this is mainly due to the knowledge of our strength, for it is that which enables us to be generous. Severity on the part of the Boers towards the natives has been in a great measure only the necessary result of weakness, and it is only with the removal of that weakness that the evils incident to it can be expected to disappear. This has received a recent illustration in the measures it was found requisite to adopt in Natal, in order to subdue the rebel Chief, Langelibalele.

If, then, we are agreed thus far, the next question is as to the position which we should assume towards the aboriginal barbarian. Our policy in this respect has never been defined or consistent, and consequently often both irritating and distracting to the natives, who are much puzzled to follow the thread of our principles through the maze of the alternate toleration of liberty and of licence, the acquisition and abandonment of territory, and the punishment or otherwise of different forms of vice. This also is the question upon which, not only the future goodwill of the Boer is almost wholly dependent, but the welfare and happiness of the native himself; and I will therefore venture to say a few words upon it, and to state, as far as I can, what the measures are which a colonist, whether Boer or English, desires.

In deciding upon the future management of natives in the Transvaal, the circumstances of the Cape, as they are in no way analogous, do not afford us much guide, and the example furnished by Natal is only of advantage as showing what should be avoided. In the latter there has, indeed, been no policy except that of inaction, and the perpetuation of native customs, native laws, and native autocracy. It has simply been the substitution of a white chief in the place of a black one; and a system which, as it was almost wholly dependent upon the ability or tact of an individual, could have no permanence or succession. With the exception of a very small number, the natives of Natal are all refugee Zulus and their offspring, and are regarded by the Zulu King as his renegade subjects, and it is to the fact of his near neighbourhood that Natal is mainly indebted for the immunity from insurrection which she has so long enjoyed. Since the late rumours of Zulu disturbance it has, I see, been proposed in a leading Natal paper, that that chief's country should also be annexed, in order to put a stop to the trouble which his threatening attitude so often occasions; but I trust these counsels will not be followed, for to do so would be to produce a unity of interest among the Zulu race which might be most prejudicial to white supremacy.

To return, however, to native management in the Transvaal. It is my opinion that, assuming that we have decided the question of our

right to be there in the affirmative, the next step is to declare that we have a right to rule and to control the savage; and, further, that it is our duty so to control him, as to wean him from his barbarous habits, and incline him to those of peace and industry. In his state of tutelage he should not be consulted any more than a child would be; he has to be *ruled*, with justice, of course, but also with firmness, and we should not omit to demand from him the same unquestioning obedience to authority to which he is used. If we do not adopt this principle, it would be far better for him, as well as for ourselves, that we kept away from him. We should also compel him to pay his fair proportion towards the maintenance of the Government, and not only with that view, but also with the express object of making him work for his taxes, and thus keeping him from idleness. Some who have lately written on the subject, and other kind sympathisers at home, see no reason why Kafirs more than other people should be required to work if they can live without it; but they do not, perhaps, reflect that idleness in the savage does not mean the same as in the civilized man. I doubt if either can be absolutely idle; but I know that the tendency of the savage, if not at healthy labour, is to do mischief, and for that reason, as well as to make him a more useful member of society, I should use all reasonable means to force him to work. I know it will be said that I want to annex his labour, and thus that my motives may be suspected; but here I am quite content to rest in the company of those who have carried on a somewhat similar operation, though on a much larger scale. Neither is sufficient importance attached to the fact that the presence of a large native population, most of whom have come into the country since the occupation of the whites, not only necessitates an increased outlay for their control and government, but also has the effect of preventing the importation of labour from England.

It is on the principles involved in these questions that the Boers, as well as English colonists, have ever been at issue with Imperial authority, and upon which depend all future relations.

There may be much in the Boer system to be reprehended, but in part of its theory it is undoubtedly correct. It is more direct and consistent, and thus less liable to distract and irritate the native than our own. When the former come into contact they understand one another then and there, and if an encroachment is made it is over at once. With us, though the process is more gradual, the encroachment is not the less sure. It is my belief that the right line lies between the two systems, and that if we will only accept as a foregone conclusion what experience shows is the inevitable result of our contact with African natives, and take upon ourselves boldly the position and the responsibilities to which we are entitled and bound, the future rule will be productive of more happy results to all concerned than have been obtained in the past. The problem has in any case now to be worked out in the Transvaal; with a material perhaps more favourable to deal with; but also upon a far larger scale than has hitherto been known in Africa; and the effects for future good or evil will mainly depend upon the manner in which the commencement is made.

One more word before concluding. I have already mentioned the



difficulties that will exist in raising a revenue sufficient for the proper government of the country, arising from the smallness of the white population, and the absence of facilities for the export of produce. To remedy this evil there is but one course open, which is, that a line of railway should be constructed from Delagoa Bay. The Portuguese Government have signified their willingness to undertake their portion, and had entered into a treaty with the Republican authorities by which they allowed the Transvaal a remission of duty almost amounting to free transit, and all that is now required is that our Government should undertake to extend the line from their boundary in the first instance for about forty or fifty miles, which would bring it to a central spot within the eastern frontier. For this distance the line is almost level, and crosses only two small rivers, so that the expense would be comparatively trifling. But there are other reasons why this important work should no longer be neglected. A pledge was given in the proclamation of annexation that all contracts entered into by the previous Government would be maintained, and it is to the apparent lapse or non-continuance of the arrangements which had been made to carry it into effect, and to the fear of Natal influence prevailing to deprive them of a long-hoped-for benefit, and cause a sacrifice of their interests to its own, that much of the present discontent in the Transvaal is to be traced.

The proposed railway is, however, of such vital importance both in regard to the financial interests of the country, and to the advantages it will offer in case of any necessity for military operation in the rear of the Zulus, that it would be wrong to suppose that any but the most serious objections will be allowed to delay its execution.

MR. DONALD CURRIE, C.M.G.: I have listened with much pleasure to the lecture with which Mr. Moodie has favoured us. I know Mr. Moodie very well, and every one acquainted with South Africa must be aware of the deep interest which he has always taken in the development of the country. I suppose no one living in the Transvaal has traversed the territory to a greater extent in order to discover the best means of communication. Mr. Moodie, with the late President, Mr. Burgers, made the arrangement for transferring the railway concession which he had got from the Portuguese Government from Delagoa Bay to the boundary of the South African Republic. At that time the President went with Mr. Moodie to Portugal and received from them a new concession for the line of railway, and also there was a treaty of commerce; but owing to the annexation we are now face to face with a great difficulty. I do not see where the capital is to be found, or where the revenue is to come from which is to make it safe to undertake the construction of an extensive line of railway. I see very clearly the immense advantage of such a railway to the Transvaal. I should like to ask Mr. Moodie whether it is true that the Portuguese Government have withdrawn their promise to establish a railway; have they agreed to construct it, or are they only promising that if the capital is provided up to their boundary, they will subsidise it?

MR. MOODIE: That is all.

MR. DONALD CURRIE: Has there been any change in the mind of the present Government in Portugal as compared with the late Ministry?

MR. MOODIE: The same Ministry exists now; they have returned to power.

MR. DONALD CURRIE: They were extremely favourable to the line of railway before Mr. Burgers gave up the Presidency, and we all know that the Republic made some arrangements with the Cockerell Company of Belgium with a view to laying down a railway. Since that time I understand that Her Majesty's Government have not seen their way to undertake the responsibility of carrying out the project.

of the Cockerell Company. Where is the capital to be got to form the line of railway? If we could get the line of railway established and that country opened up, there would certainly be developed immense resources for the benefit of mankind. But what sort of assistance would the Government be required to give to enable it to pay? No doubt the country is boundless in its natural wealth; it has mineral, agricultural, and other resources of the most plentiful character, but the line of railway is necessary. The difficulty appears to be that it would have its terminus in a foreign port. At Delagoa Bay we have forty feet draught of water, while at Natal we cannot pass the bay with our steamers drawing ten feet, and a very large sum of money will have to be expended to make Durban a serviceable port. No doubt the great secret of the dissatisfaction in the Transvaal at this moment is owing to the fact that the people interested are in doubt whether they are to have the line of railway. I went to the Government with Mr. Paul Kruger, and the other Delegates from the Transvaal Boers. They returned to South Africa satisfied with the kindness shown to them by Lord Carnarvon, but the people who sent him here are not satisfied. Unless some satisfaction is given to the inhabitants, either in material assistance or otherwise, there may be difficulties which I think Mr. Moodie comprehends very well. Then come the relations with the colonies as to taxation for traffic which passes through. A percentage is charged by way of duty on importations, and as there are no means for establishing Custom-houses along the frontier, if drawback is to be got, it is not easy to arrange a bonding system at present. The Boers do not like direct taxation, and the difficulty is how money is to be obtained by way of revenue. Is there any enlightenment to be given on these points by those who know by personal knowledge, as Mr. Moodie does, what has been occurring in the Transvaal? Those are the points which occur to me. The great want for South Africa is white population. If people get out there, there is plenty of occupation; but when they arrive, they are confronted by an inert and idle Kafir population. There is no question as to the Transvaal being one of the richest countries in the world. The wheat grown there is equal to South Australian wheat, and the mineral resources of the country are boundless. I should like to have some practical statement from Mr. Moodie or any one who can say what is to be the outcome of this question of the establishment of a railway, for the development of the country requires it.

Colonel HENRY CLINTON: I should like to ask whether the Governor is aware that he can do that which you do in private life: when you have property that you cannot get at, you are apt to go to a lawyer and ask him to negotiate a private loan. Is that possible in this case?

Mr. SANDERSON: I, for the most part, agree with the paper which Mr. Moodie has read. I consider it a most valuable contribution to the subject to which it relates, and, as Mr. Donald Currie has suggested that I should say a few words on the subject from a Natal point of view, I will endeavour to do so. There are a few points that struck me in Mr. Moodie's paper on which, as a resident in the colony of Natal, I may be able to put the facts, perhaps, in a somewhat truer light. Mr. Moodie says the Transvaal has no return from Natal nor from the Cape, of a large amount drawn by those colonies in the shape of Customs duties. I would beg to remind Mr. Moodie that Natal keeps up good roads at a very heavy expense. It has already spent not very wisely, but it has spent 200,000*l.* in the improvement of its harbours, and is now engaged in making railways at great expense. In all these advantages the Transvaal participates, and, therefore, to a certain extent, at all events, it is a *quid pro quo* for the Customs duties that are claimed. Mr. Moodie told us that when Her Majesty's Commissioner went to Natal in 1843 he reported the natives to be 10,000 in number. That is correct, but at that time the Commissioner had no means of knowing the real number of the population in the remote parts of the colony, and a more correct estimate was to place it at 100,000. There were 80,000 to 100,000 natives at the time the country was taken possession of by the English Government, and the large increase which has taken place since, is due partly to natural increase and partly to the return of tribes who had fled before the conquering Zulu, and to a very considerable extent, I admit, to the cause which Mr. Moodie spoke of as being the sole source of increase, namely, an influx of natives from surrounding territory. It is only fair that those other facts should be borne in mind,

because a very unfair impression is apt to be conveyed by the idea that the native population has increased under British rule from 10,000 to something like 300,000 or 400,000. As regards the segregation of the natives in Natal, and the dangers to be apprehended from that, I entirely agree with Mr. Moodie. I think that has been the source of much of the trouble we have in Natal, and will be, perhaps, more remotely, less directly, the source of the troubles that are now threatening us in the Transvaal and the Zulu country. The question of firearms has been referred to by Mr. Moodie, and with what he said on that subject I perfectly agree; but I would ask any intelligent audience whether it is a thing creditable to an English Government that their sole representative in the Zulu country should be the man who is importing at the rate of something like 10,000 stand of arms every year for sale among the natives? That is the fact, and it is well known to the Natal authorities, and yet they either will not or dare not dismiss that man and put another man in the position of their representative in the Zulu country. Mr. Moodie spoke of Sekukuni, and here it strikes me he was somewhat inconsistent, somewhat at variance with himself; he spoke of the Boer Government declaring war against Sekukuni. Now, a State does not usually declare war against its own subjects; it may treat them as rebels, but it does not declare war against them. The Boer Government did declare war against Sekukuni, and yet professed to regard him as a rebel. Now, Lord Carnarvon has expressed his conviction that the Boers had no right to regard Sekukuni as a subject, and, therefore, no right to treat him as a rebel. That opinion I had previously arrived at for myself from the most careful investigation I could form. The treaties upon which the Transvaal Government professed to found their authority over Sekukuni were simply in Lord Carnarvon's opinion and in my humble judgment, waste paper, and I very much fear that the same thing will be found to be the case with regard to the treaties which are alleged to subsist between the Zulu people, with whom we are now threatened with trouble, and the Transvaal Government. I am not in the least degree surprised that those troubles should now be threatening, because for twenty or twenty-five years Sir Theophilus Shepstone, as representing the head of affairs in Natal, has been supporting Cetewayo and his father, the former King, in their position with reference to the Transvaal Boers. The Transvaal Boers have been represented as encroaching year after year upon the Zulu country, and the Natal Government, of which Sir Theophilus Shepstone was, in regard to native affairs, at the head, appears to have supported the Zulu King in the position he assumed. But, no sooner is the country annexed and become English territory, than Sir Theophilus Shepstone, in my opinion, takes up the very position which he had condemned when assumed by the Transvaal Government. I ask whether it is to be wondered at, that Cetewayo the Zulu King should resent that and feel perplexed. No wonder he is arming himself at every point against what he fears to be an encroachment on the part of his former friends the English, or rather I should say he no longer regards Sir Theophilus Shepstone as an Englishman. He therefore looks to the Natal Government and the Queen for the maintenance of that support which he formerly received from Sir Theophilus Shepstone. I scarcely agree with Mr. Moodie with reference to the native population of Natal not being contented. I think the fact that something like 15,000, or at the very outside 20,000, white people have been living in the midst of 200,000 or 300,000, or as it is now said sometimes 400,000 blacks, and that there has been comparatively little crime of any kind either against property or life among that native population, shows that they are more contented than Mr. Moodie appears disposed to allow. That the feeling among the natives is less satisfactory now within the last two or three years is a lamentable fact, and to my thinking it is not at all to be wondered at. Mr. Moodie referred to the affair of Langalibalele, and without going into that very long and complicated question, I think there were circumstances connected with that which probably account for the feeling of alarm and distrust with which the natives in Natal are now disposed to regard the Government. That the natives generally in the very remote parts of South Africa are inclined to regard British rule as a blessing is an unquestionable fact. It was only a few years ago—a year or two before the Langalibalele trouble broke out—that messengers arrived from nearly all the more important native tribes from a great distance beyond the Transvaal country asking to be taken under British protection.



I think I had it on the authority of Sir Theophilus Shepstone himself that a very large proportion of the tribes beyond the Transvaal asked to be taken under British authority, and if there is any change in their feeling now towards the English, it will be from such causes as those to which I have adverted in the case of Sekukuni and Cetewayo the Zulu King, that the policy of the English Government has changed, and they see they cannot rely as they had been taught to do upon the straightforwardness, the justice, and the fair dealing of the English. I cannot sit down without expressing the fervent hope that now that the territory has become English soil, something will be done to advance a country which has such boundless capabilities. I had the pleasure of visiting the Transvaal twenty-seven years ago, in fact I entered the country on the very day the treaty was concluded by which its independence was guaranteed, that independence which has now on very slender pretext been taken from it. At that time the mineral wealth of the country was scarcely even suspected. It was known that there were lead and silver, but beyond that little was known of it. However, I saw enough of it then, and I have heard enough of it since, to feel sure that it is a country the capabilities of which as an agricultural country, and also as a mineral country, it is almost impossible to over-estimate. I trust something will be done, whether by railways or otherwise, perhaps by the aid of the English Government, to advance its interest. Although I am a Natal colonist I shall certainly not plead guilty to entertaining that narrow feeling to which Mr. Moodie adverted of not desiring to see a railway to Delagoa Bay, if that will forward the interests of the Transvaal. I think the interests of the whole Empire are so interwoven that no one part can prosper except to the advantage of the whole.

MR. BECKER: I gladly endorse everything that has been said by Mr. Donald Currie; I wish also to thank Mr. Moodie on behalf of my friends in the Transvaal. Mr. Donald Currie put the question, how are we to raise the money for the purpose of constructing this railway? As far as I know, during the administration of Mr. Burgers, a rate was levied of 30s. on each farm situated in the territory of the Transvaal. I believe there were about 25,000 farms altogether, and that revenue would cover the interest. The late President tried to raise the money and partially succeeded, but owing to the war with Sekukuni, and other causes, the negotiations came to nothing. Mr. Donald Currie remarked that he thought there would be some difficulty on account of the dissatisfaction at present existing amongst the Boers in that country. As far as I know—I have been there many years—a great deal of that dissatisfaction is caused by the authorities having failed to carry out their promises. I know that verbal promises were made to individual Boers about the railway to Delagoa Bay, &c.; those promises are entirely ignored and the Boers feel it considerably, that is one of the principal causes of this dissatisfaction. It is the same story over again. If you recollect, three years ago there was nearly a revolution at the Diamond Fields. What was the cause of it? The people represented the case to the Imperial Government, and very fortunately the Government sent out a British soldier and a gentleman, Colonel Crossman. That gentleman investigated matters and restored order, and the unpopular Governor then administering the Government was superseded by Major Lanyon. The present happy result is a proof of his administration. Why could not that be done with our country? Instead of sending an independent gentleman, disconnected with local politics, they have filled the offices with men from Natal. We gave up our independence, and I with hundreds of others hailed annexation with delight, hoping for a better state of things, but when I left there was a great deal of discontent and disappointment owing to the bad administration.

THE BISHOP OF PRETORIA: I really do not rise to occupy ten minutes, but to ask a question, but perhaps before I do ask the question you will allow me to express my gratitude that this Institution opens its doors to outsiders, and to Mr. Moodie for giving an outsider an opportunity of hearing his very excellent lecture. I am sure all those who, like myself, want to understand the question, must be grateful for such a lecture. We have heard from a previous speaker that the representative of the British Government in the Zululand is the great offender in a matter of the vastest importance, in introducing into that country firearms for the use of the natives. I should like to ask if any steps, and if so, what, have been taken or could be taken

to bring such a fact to the notice of the Home Government who might act with some more decision than it appears the Government in the colony has shown, because it strikes me, as one hearing it for the first time, that it is an act of the deepest importance, and the grossest injury to all our South African possessions, and that, therefore, some steps should be taken, and I should be very glad to hear that some steps are about to be taken to put down such a very grievous evil as that seems to me to be.

MR. CAMPBELL JOHNSTON : To answer the question just now put, I recollect to have seen a little while ago in one of our newspapers an extract from a letter which was written by the Society for the Protection of Natives. It was written to the Colonial Office, bringing before it the fact that our representative in Zululand was the greatest offender in the introduction of arms. I believe it was acknowledged, but with what results I have not heard.

The CHAIRMAN : The introduction of arms by whom ?

MR. CAMPBELL JOHNSTON : By this gentleman ; his name is Dunn ; there is but one, therefore one does not offend by mentioning his name. He is the right hand man of the Zulu Chief.

MR. SANDERSON : Might I be allowed to add one word ? Mr. John Dunn is the emigration agent of the Natal Government in Zululand, and he is paid a salary of 300*l.* a year for his services in that capacity. The Natal Government simply disclaim any responsibility for his acts outside the particular office for which he is paid 300*l.* a year.

MR. MOODIE : I have to express my gratitude for the very lenient criticism gentlemen have passed on what I have said. In regard to what has fallen from Mr. Sanderson with respect to the native population of Natal, I notice that in Mr. Trollope's book he puts the number of aboriginal natives at the time of the English occupation even lower than I have, viz., at 3,000. I had not before heard that subsequent estimates had been made as stated by Mr. Sanderson. At the time of my arrival there in 1844, Langalibalele was not in Natal, nor many of the other principal tribes, the main aboriginal body being the fish-eating natives on the coast, and some few outlying ones in other parts, so that though my estimate may be low, I am not at all inclined to put it down as high as Mr. Sanderson at 100,000.

Mr. Currie asked where the capital for the railway is to come from. I think that has been answered by the gentleman who said a word or two on the subject, and I agree with him that if the Transvaal was regarded as a man's own private property, and its resources placed at my disposal, I would soon find the means of carrying out a work so palpably necessary for making it reproductive. I have not, however, considered that a question for an outsider to enter upon here in any special way. As to Sekukuni, when the Transvaal Boers drove Moselikatse out of the country, the territory now claimed by him was unoccupied. The father of Sekukuni had with his tribe been driven out of the country before that time by Moselikatse, and it was only after the Boers came into possession that he returned to it. The present Government are placed in a rather anomalous position from the fact of their having, prior to the annexation and while the Boers were at war with Sekukuni, declared the latter to be an independent chief, and to have the rights of a belligerent power, and now, as in the case of the Zulus, reversing their attitude and enforcing payment of the war indemnity which he undertook to pay to the Boer Government, as a condition of their ceasing hostilities at the peace which was patched up at the last moment.

With regard to John Dunn, nothing has pleased me more than to hear the remarks that have fallen from different gentlemen on that subject. It has been a crying shame for long. I was at Delagoa Bay myself in the early part of last year, and while there Kafirs arrived from Dunn. I saw his own letters, and 1,100 guns were sold in one day to take home to the Zulus, and it is through this means that Cetewayo is holding his present position. It is, however, manifestly unjust to blame the Portuguese at Delagoa Bay for this, or to expect that they shall put a stop to the traffic, while unlimited supplies have been allowed to the natives from our own colonies. I beg in conclusion to return you my thanks for the kind attention you have given me.

The CHAIRMAN : Ladies and gentlemen, it would be wrong for me to detain you long

after the very interesting lecture that has been given by Mr. Moodie and after the very intelligent criticisms that have been made upon it. But having accepted the position of Chairman, I think it but fair that I should show that I know something of the subject. I agree with many of the points that Mr. Moodie has brought before us, but with some of them I cannot entirely coincide. I had the honour of commanding the united troops of South Africa, and therefore it was my province to learn as much of the country as possible. I had also the honour of sending the troops into the Transvaal at its annexation, and therefore a large amount of correspondence concerning that annexation naturally passed through my hands. Now I think it but fair in the first place to observe why we annexed that country, and I wish to state in a few words what were the reasons for our doing so. There had been some dissatisfaction on the part of the Boers and others who carried on the Government at Pretoria, in consequence of the import of arms which was being allowed by the Cape Government and the Natal Government, and which were being sold to the natives of South Africa. That has been one of the great reasons of the troubles that have arisen. During the time I had the command of that country, and which has been for four years and a half, I believe 400,000 stand of arms have been sold to these natives. I cannot entirely agree with Mr. Moodie in condemning the merchants who sold them, because I think it is the province of the parent Government always to give laws and directions to its subjects, and to tell them whether they have a right to sell arms or not. It is a very hard case that our merchants should be accused of want of patriotism in selling arms, while the laws allow them to do so; laws are meant to be obeyed, and if it was considered by the Government that it was deleterious to the interests of England that arms should be sold, it was in my opinion the duty of the Government to prevent that sale, and which they had ample power to do.

As regards the climate of that wonderful country, the Transvaal, I certainly concur in what Mr. Moodie has said, as to its being, perhaps, one of the most extraordinary colonies that England has annexed to itself. It consists of three separate areas. The south-easternmost part is generally called the High Veldt, and that, as Mr. Moodie has told us, averages from 4,000 to 7,000 feet above the level of the sea. That country, therefore, is not a corn-growing country, but it is very rich in minerals, and in the eastern part there is a large amount of gold. I had the pleasure of travelling twice over that eastern section for military reasons, and I saw the greater part of the centre of the Transvaal. The climate is most excellent in consequence of the great height of this portion. Whenever we approach the tropics, the health of the country, and its salubrity for the British constitution, depends very much upon its height. This country is exceedingly salubrious. In it I selected a spot for the cavalry of my division, in order that the horses might remain healthy through the summer. The central portion of the Transvaal is rich for corn-growing and also in minerals. Esterling is a great gold field, from which much ore has been extracted, but the extreme northern part is a low country and deleterious to health. In one portion of it you find the tsetse fly, that destroys horses and makes it so difficult to enter there with troops. It is difficult for Europeans to live in the Low Veldt; it is tropical and is covered with tropical plants. The high range of country lower down, and here (*pointing to the map*) was our happy hunting ground, for my aide-de-camp and myself, while passing over it, killed, in about sixteen days, sixty-nine head of large deer, of which more than twenty were the gnu, of which you may see specimens in the Zoological Gardens; When this country was annexed, I set up a fortified station on the south-eastern borders of the Transvaal, in a position which would be extremely valuable; and as regards Cetewayo and Zululand I give my reasons for building that fort. The town is called Newcastle (and very appropriately so), as immense quantities of coal exist there. The fort in that position, at the neck leading to the Transvaal, would check any movement that the Zulus might make into the colony. We built barracks at Standerton, on account of the high ground, for the health of the cavalry; besides which, it is in an excellent position for communication with Utrecht and also Pretoria, in case of any difficulties arising amongst the Boers, but which I do not anticipate. Hence troops could easily be sent to Middeburg, should Sekukuni think proper to endeavour to do any mischief in the



Transvaal itself. I will not, however, occupy your further time in stating the military reasons for the works which I undertook. I think it is best to stick to the point which has been presented to us in the paper, with reference to the future of the Transvaal, and as so much has been said on the question of railways, it only would be right to say a word or two upon that subject. The question has been raised whether the railway should start from Delagoa Bay, or whether it should pass through Natal, or whether it should go from East London, through Queenstown and the Orange Free States, and so towards the north, or whether it should go from the Cape itself by Beaufort West. In a railway, a great deal depends on the port from which the railway starts, and unfortunately in South Africa we have no good harbours; Sir John Coode's estimate for making a harbour at Port Elizabeth was 900,000*l.*, and that is no small sum. At East London he estimates the cost of making such a harbour as is now required at 400,000*l.*, and at Durban, in Natal, at 400,000*l.* The ports are distant from the Transvaal: I do not say that the money should not be spent upon them, but the question Mr. Moodie has brought before us is especially the Transvaal, and, therefore, I think that is what we should regard especially this afternoon. Delagoa Bay is undoubtedly the best harbour in South Africa, and it is the nearest to the Transvaal. I agree in one thing, that the difficulties in starting a railway from that port would be very great so long as it belongs to the Portuguese, therefore, I sincerely trust some arrangement will be made with Portugal by the British Government that will enable it to become British property. It is not that I should not wish to see a railway through the Cape Colony or Natal, but I should like to see a railway from Delagoa Bay into the Transvaal. The difficulties, as far as the climate is concerned, are not so great, especially looking at the energy that has been shown in the construction of a railway through the Isthmus of Panama, where, some say, that one hundred men per mile died in making it. I believe there would be no such difficulty in the construction of the Delagoa line, for it is only to a certain distance from the coast that the low unhealthy country exists. The high part of the country lies 4,500 feet above the lower or coast level; when once this is surmounted, it is almost a level plain until you arrive at Pretoria, the same thence to Potchefstroom. As regards the annexation of this country, we annexed it in order to prevent the native tribes from attacking it; we felt as long as the country was inhabited by white people, the paramount State, England, the most powerful amongst the white colonies of that country, must protect it, and, therefore, if the Boers, in their folly, or their conceit, determined to annex, as Mr. Moodie said, a considerable amount of Cetewayo's country, whether they had a right to treat with Cetewayo to do it or not, still if Cetewayo determined to attack the Boers, we felt that he would easily have overrun the Transvaal; and, had we not taken action when we did, he would have burnt Pretoria, and Heidelberg, and every station on the eastern side of this country. We, therefore, took the initiative, and sent a small force there (the name of England goes a long way in that country); he was thus prevented from carrying out his intentions. I think it was the wisest measure that could have been adopted for Lord Carnarvon to choose for that particular duty his Excellency Sir Theophilus Shepstone, who is an exceedingly clever man, has a perfect knowledge of the Dutch language, and also of the Zulu language, and is intimately acquainted with Cetewayo, the King of the Zulus. His appointment was one which commanded general confidence. In my opinion he performed his very arduous duties in a judicious manner; his position was certainly difficult, he was said by some to have turned against his son, Cetewayo, and why? Because, when he was Secretary for Native Affairs in Natal, he had to guard the interests of Natal, and so keep the Zulus as quiet as he could; and he was supposed rather to take the part of the Zulus than of the Boers; but as soon as we had annexed that country, his business was to endeavour to be even-handed, and, therefore, it looked as if he was playing false with Cetewayo. An observation has been this afternoon made, why did we not put down Cetewayo? Gentlemen, I can assure you war is a very serious thing; from the mouths of the head men of Cetewayo, I ascertained that Cetewayo has at least 20,000 men in arms, 15,000 of whom have muskets, and at least 2,000 of those are breech-loaders. He has no cannon, though he has tried to get them. In my experience in South Africa, I

found the 2 cwt. small guns of the greatest utility, and it behoves us to take care to prevent the natives getting cannon. An observation has been made with regard to Mr. Dunn, and it has been said, why do not we prevent Mr. Dunn from assisting Cetewayo? I beg leave to observe that Cetewayo's country is as independent of Great Britain as Madagascar, or as any other part of South Africa. We have no claim over that country, we make treaties with them, but we cannot say to Cetewayo "You shall not buy arms;" we can only, by our influence, try to prevent it. John Dunn has as good a right to buy muskets at Delagoa Bay, as England has to buy them of Belgium, or anywhere else. Cetewayo has now got a large army, and he has a clever commissariat entirely administered by the women of the tribes. These women carry many days' food for their husbands on their backs; they think nothing of running twenty miles of a night to carry them their food, and, therefore, Cetewayo could easily make a raid into our country of, say 150 or 200 miles, and his troops would be supplied by a commissariat nearly as perfectly for their requirements as our troops are, by the transport carriers. We should, therefore, be very cautious in saying that Cetewayo could not do this or that, or that we could put him down. I believe Sir Edward Bulwer has adopted the wisest course in causing the arbitration which is going on at this moment, and which I have every reason to believe and hope will end in the most satisfactory way, and that an arrangement will be come to by which we shall avoid a war in that country. If we could stave off wars in South Africa for some time, it is my belief that by giving the inhabitants employment in the construction of railways and other works, we shall civilize the people, and it is better to civilize them by civil means than by military operations.

Mr. Moodie referred to some one who rather condemns the policy of Great Britain as to its colonies, and holds up to our notice the Spaniards and Portuguese as being much more successful than we have been. I cannot help thinking that the Spaniards and Portuguese may have improved their vast colonies; but still when we look to the history of Pizarro, Cortes, and others, we shall generally find that their operations have rather been towards improving the people off the face of the earth than civilizing them in the fashion which Great Britain uses her best to effect. We now have in South Africa a Governor who is a man of justice, of equity, of talent, and determination, the attributes that an Englishman should possess, and that is his Excellency Sir Bartle Frere. If any man can raise the British name in that country beyond the great position which it now holds, I believe that man is Sir Bartle Frere. He is now using his best endeavours to quiet Africa, and although the commencement of such a work may be a military one, I have every belief that he will be successful. He is animated with the ideas of justice and honourable feelings towards the natives, as well as towards ourselves. With reference to the Boer inhabitants, I consider them to be an honest, good-feeling, excellent people; they are exceedingly religious, as Mr. Anthony Trollope has stated, and as has been brought before us by Mr. Froude and those who have lately visited that country. The Boer is not to say an ignorant man, but he has an entire want of knowledge of the rest of the world; he has buried himself in the wilds, and consequently does not understand our advancement in civilization. The late Prime Minister, Mr. Gladstone, once said that there is no reason to suppose that we are wiser than our ancestors because we are more scientific. I am not at all sure that the Boers are not as clever, in their own generation, as any of us, but they take a long time to develop their ideas and to think about things. In order to show you the total ignorance of these men, when I sent the army up into that country, the Boers came round my Officers, and said, "We know what you are going to do. We know why you are coming here; you intend to lay hold of all our handsome young men, and take them off to the Grenadier Guards, and you intend to tax us, and worry us in every kind of way, and make us pay all the expenses, not only of this annexation, but also to tax us to pay for your war with Russia, without giving us any share in the government of our country." We explained to them that what we were doing was entirely for the object of saving them from the natives. When they saw that we paid for everything in gold (for they would not touch a bank-note), and that a great deal of gold passed into their hands, their feelings were changed, and turned very much in our favour. I have every confidence that Sir Theophilus Shepstone will be

able to give matters a right direction. One of my Officers, whom I placed in command of the cavalry, received while I was down at Williamstown, letters from the Boers of the Transvaal, offering their services as cavalry, and to bring their own horses. We had also offers of service from volunteers in all directions; this is exceedingly satisfactory and encouraging. One of the great difficulties of emigration into the Transvaal is that it is very expensive to go there. It costs a great deal of money to go to Cape Town, as much again to go to Durban, and more still to go from Durban into the Transvaal. It also takes a long time. It is impossible for a man to go from England to the Transvaal under three months. As soon as he gets there, if he is steady, he will be well rewarded. When I was there, bricklayers' wages were 25s. a day and carpenters' wages 25s. a day. A sovereign was charged for shoeing a horse; in fact, all labour is rewarded in the same proportion. The greatest difficulty I had in building barracks in Pretoria was the want of labour; therefore, I think, as the field is open, all that is to be done is for the reapers to go and reap the harvest. This country is a wonderfully productive country. The great difficulty which Mr. Moodie has so prominently brought before us is that the Government has no land to sell to the emigrants who may go there. The system of the Government of the Transvaal has been that when a young boy reached the age of sixteen, he had a right to ask his Government for a grant of 6,000 acres of land. That has been one of the reasons for the quarrel with the natives, because the Government allotted this land, and thus encroached upon the native possessions. I have known instances in which 6,000 acres of fine land, which, if it had labour, could grow corn, has been sold for two bottles of whiskey. I knew of 6,000 acres close to Middelburg sold, some three or four years ago, for a few bottles of whiskey and two or three pair of stockings, and for which, since the annexation of the Transvaal by the British Government a gentleman refused £1,100. Some gentlemen are very large proprietors, one at Potchefstroom possesses no less than 800,000 acres of land, the greater portion of it being corn-bearing. He naturally wishes to get emigrants into the country, and he invites them upon the most reasonable terms. I see no reason why companies should not be successful in arranging with these large landowners to get land. As a total outsider, I would advocate that large taxation should be put upon these large landholders, and thereby oblige many of them to sell to the State and others their lands. This would give the State a means of encouraging the emigrants who came out by allowing them to obtain land at something like fair prices. I believe this alone would help forward the Transvaal to future and great prosperity. The Transvaal possesses a few diamonds, a great deal of gold, and lead in very large quantities. The lead produced, now goes entirely to the centre of Africa, in order to utilize some of those 400,000 stand of arms that have been taken there; and so great is the profit in lead mines, that a gentleman near Potchefstroom who purchased, about two years since, an estate containing this mineral for the sum of 50*l.* or 60*l.* sterling, is now realizing from this property about 2,000*l.* a year. The cobalt mine near Middelberg was purchased from one of the Dutch farmers. It was bought for about 1,000*l.*; it is now said to be paying many thousands a year. Coal is most abundant.

The native question, however, is the great difficulty of South Africa. As to sweeping the natives away by force of arms, or by the brandy bottle, I believe the thing, even if it were just or right, is impossible. The nature of the habits and customs of the people encourages an increase in the population, and as we accept the principle of putting down all fighting amongst the native tribes, so it is a natural consequence that they should increase enormously; they have broad fertile lands, with numberless herds of cattle. Thus they have plenty of food; no starvation exists under the mild and honourable laws exercised by Great Britain; we must therefore anticipate a continual increase of population, and we must therefore be prepared to meet this difficulty. Our great panacea for this is to teach them as far as possible (for they are a very lazy race), the advantages of our modern institutions, that are now cropping up all over the land. To this end we should encourage railroads through the country, from Delagoa Bay as well as from other ports. I should be only too glad to see a check placed upon the sale of arms; they look at arms in the first instance as a great prize, as a boy does a watch. It must not be



supposed that the natives cannot use firearms. To my certain knowledge many of them can shoot just as well as we can, and they only require a small amount of practice to make them good marksmen. There is nothing so dangerous as to place a firearm in the hands of a native, with their ignorance and fanaticism. It is as dangerous to place a musket in the hands of a native as it would be to put a fire-brand in the hands of a child, and leave him in his bedroom.

As to the future government of this country, it would be injudicious for me to say more than a word. As long as Great Britain has anything to do with the annexation of a country it is always guided by the most honourable principles. It has been assured to that country by Sir Theophilus Shepstone that they will have their parliamentary Government, but he has not said when. Things must develop themselves, war must cease, and other circumstances happen before such an enlightened institution can be put into their hands; and before we feel sure that they are able to use it for their own benefit, as well as for the benefit of South Africa. Everywhere it is the endeavour of Her Majesty's Government to send officers to those countries whom they can trust, and in their selection of Sir Bartle Frere, they could not possibly have made a better. In Sir Theophilus Shepstone they have one whose perfect knowledge of the country and whose judgment will bring them through the difficulties, if any one can. As to the Transvaal itself, I consider that by a judicious Government, and by the support of Great Britain, it will become in time one of the most valuable of our colonies; it has all the conditions of greatness, and owing to its climate, its natural position, and its fertility, I believe it has a future not to be exceeded by that of any one of Her Majesty's colonies.

I am sure you will all agree with me in passing a vote of thanks to Mr. Moodie for his very excellent paper.

## LECTURE.

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Friday, May 24th, 1878.

ADMIRAL HUGH DUNLOP, C.B., in the Chair.

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### FACTS CONNECTED WITH THE NAVAL OPERATIONS DURING THE CIVIL WAR IN THE UNITED STATES.

By Rear-Admiral R. V. HAMILTON, C.B.

At the present time, when our country may soon be involved in a war in which the Navy will have an important part to perform, and with ships and weapons as yet almost untried in actual warfare, I trust that the following facts that I shall place before you, connected with the very important work performed by the American Navy during their Civil War, may not be uninteresting, and that some information may also be derived from them, as, owing to the exigencies and peculiar nature of that war, a very great portion of the naval work was done by ships and guns invented or adapted to meet novel modes of warfare. And I have no hesitation in saying, it was their naval superiority which enabled the Northerners to penetrate through the various rivers, creeks, and bayous into the heart of the Southern Confederacy, whereby the Armies were able to advance, when, owing to physical obstacles, they must have been arrested in their onward march. The Navy also, in several instances, decided the fate of battles by the protection afforded by its fire to the wing of the Northern Army resting on a river, as at Pittsburg-landing and at Vicksburg; and the escape of Morgan's expedition in Indiana and Ohio, across the river into Kentucky, was prevented by a gunboat, which arrived at different fords in time to stop his men crossing. On the Navy, in a great measure, also depended the supplies and transport of the Army, but, as these services were not as showy and interesting as the numerous battles between the conflicting armies, they were but little known or appreciated by the general public; a complaint, I need scarcely say, not peculiar to the American Navy.

Those who have read the history of the Paraguayan War will also know that, but for their Navy, it is very doubtful whether the Brazilians would have conquered the Paraguayans, at all events not for many

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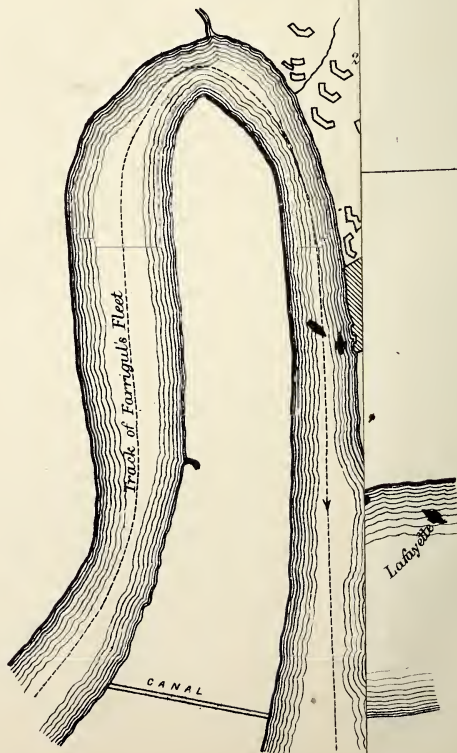
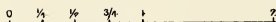
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MISSISSIPPI R

Scale of Miles



more years than the war lasted. I, therefore, infer that in a war between two countries, if either or both are intersected by rivers, the victory will rest with the one possessing the most powerful Navy, supposing they are in other respects tolerably equally matched, as was the case in these wars, where, owing to the long distance from their bases of operations and other obstacles, the numerical superiority of Federals and Brazilians would have been neutralized but for their Navy.

Although I was on the North American Station during the greater portion of the Civil War, I must confess to great ignorance in nearly all relating to the naval operations; and presuming many of my hearers and future readers are not much better informed than I was, will, I trust, be my apology for bringing before them the information I have but lately acquired, and also the hope that valuable information may be obtained, in discussion, from those who have read up the subject more completely than I have done.

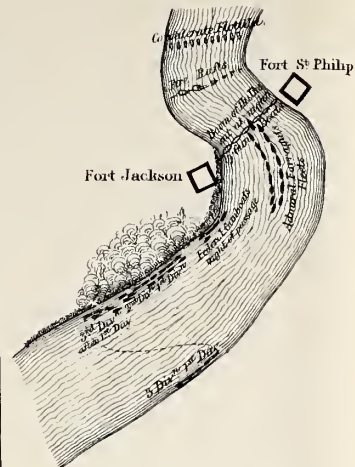
It is unnecessary to enter into the reasons for secession, observing, however, that by April, 1861, all the slave States had seceded except Maryland, which, being a border State, would have felt the whole brunt of the war at first, but their feelings were, beyond question, undoubtedly with the South, although, fortunately for herself, Maryland was kept down by force of arms. The Civil War commenced on April 12th, 1861, when the Southerners fired the first shot at Fort Sumpter, in Charleston Harbour, which speedily surrendered, when the Confederacy possessed all the forts, except Fort Pickens, near Pensacola, and the whole sea-board from the mouth of the Chesapeake round by Florida to the Rio Grande, the boundary between Mexico and Texas. They also commanded that important artery, the Mississippi, from its mouth to its junction with the Ohio, the northern boundary of the eastern slave States.

The warlike stores in the country were probably about evenly divided between the belligerents, as the Confederates had seized all the Southern forts and navy yards.

The guns consisted of 10 and 8-inch Columbiads, 42, 32, and 24-pounders and under; no rifled pieces had been introduced into the Army or Navy. The North, however, retained the fleet, then consisting of 42 vessels, steam and sail, carrying 550 guns, manned by 7,600 seamen and marines. It was at once seen that this force was totally inadequate to maintain a blockade of over 3,000 miles of coast, to provide for the wants of the Army, and to obtain command of the inland waters. By December, 1861, the number was increased to 264 vessels; December, 1862, to 427; December, 1863, to 588; December, 1864, to 671; manned by 51,500 men; most of these vessels were, of course, not fit to encounter hostile fleets at sea, but they were adapted to the peculiar work required of them, which is saying quite enough.

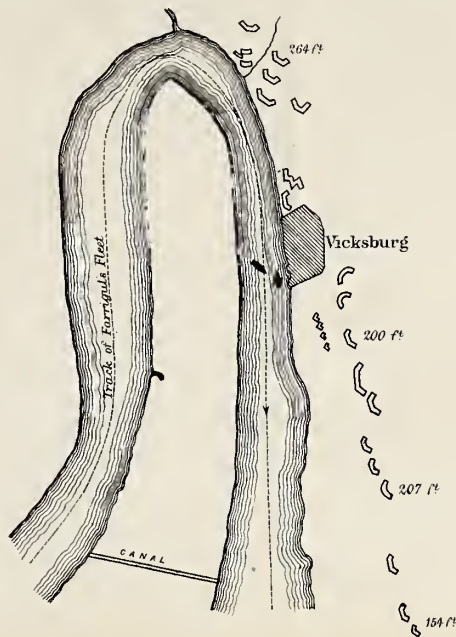
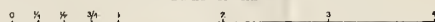
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## NEW ORLEANS FORTS.



## FEDERAL

2	Monitor	Tenamoch.
3	"	Machatlan.
4	"	Winnebago.
5	"	Chickasaw.
5	Steamer	Octavara.
6	"	Brooklyn.
7	"	Metacombet.
8	Flagship	Hartford.
9	Steamer	Port Royal.
10	"	Richmond.
11	"	Seminole.
12	"	Lackawanna.
13	"	Kearney.
14	"	Monongahela.
15	"	Alasca.
16	"	Ossipe.
17	"	Galena.
18	"	Onida.



## MISSISSIPPI RIVER

[illegible]



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Ericson, it appears, offered his invention to the Emperor Napoleon in September, 1854; it is fortunate for us it was not offered to, and accepted by, the Russians, or our fleets in the Baltic and Black Sea might have come to the same untimely end as the "Congress" and "Cumberland" frigates, from the guns and ram of the "Merrimac." Many other Monitors were built after the success of the original; also numerous wooden vessels, for the various work required in harassing the enemy in the network of rivers and creeks intersecting the Southern Confederacy, experience proving screw vessels were not well adapted for the crooked and narrow rivers, from inability to go straight astern, and being, consequently, obliged to expose their whole broadsides in turning, if necessary to retreat. A dozen side-wheel steamers were built, but as these did not meet all the requirements, 34, both ends alike and adapted, like our Upper Thames steamers, for going either way were built, drawing only 8 feet water and heavily armed. On the Upper Mississippi, a fleet of ironclads was built by private contract. Mr. Eads, of St. Louis, undertook to launch 7 with engines and boilers on board in 65 days from signing the contract, ready to receive their crews and armaments; the first one was launched on the 12th of October, 1861, 45 days after the keel was laid; the next, 10 days afterwards, the remainder within the assigned time. These vessels only drew 6 feet and carried 13 heavy guns, 11 and 9-inch, 3 of them firing right ahead and 2 astern. When we consider this was done on the Upper Mississippi, where an armed vessel had never been seen prior to the war, that when the contract was signed, "the timber to construct them had to be cut, the engines "to be built, and that the rollers and machinery to roll the iron plates "to be constructed," we may marvel at a private individual undertaking the responsibility; did it not show what can be effected by a free people fighting for what they consider a just cause?

In April, 1862, Mr. Eads prepared plans for 8 light draft ironclads, to draw  $5\frac{1}{2}$  feet, also others of  $4\frac{1}{2}$  feet, with a turret of 8 inches of iron, and even of the very light draft of  $3\frac{1}{2}$  feet, with a turret of 6 inches, and most of the vessels he constructed drew less water and had more speed than was contracted for. In less than a year Mr. Eads built 14 armoured vessels, 4 mortar boats, and converted 7 transports into "tinclads," as musket-proof craft were called—all vessels that may be considered perfect successes for the work they were built to perform. The American Government knew what they wanted, threw overboard all old ideas when found unsuccessful, and availed themselves of the undoubted inventive genius of the country and its resources, put their best men forward, and succeeded, and although their innovations were, in many respects, apparently startling, they were, in reality, well considered beforehand.

Great as is the credit due to the Northerners, the Southerners were fully their equals in inventive genius and readiness of resources, as is shown by the 13 or 14 ironclad rams they constructed, or which were destroyed before completion; the "Manasses" for instance, which, in October, 1861, six months only after the declaration of war, drove the Mississippi blockading squadron out of that river, and the "Merrimac,"

in March, 1862, of whose exploits it is unnecessary to say more. And so badly off were they for iron that the iron bolts of some of their ironclads were made from lightning conductors; and the heaviest gun they possessed at the commencement of the war was a 10-inch smooth-bore, but before it was over they had 10-inch rifled guns, and even 600-pounders. Before the war, the South depended on the North for, I may say, every manufactured article; but, as Von Scheliha observes, from necessity, "foundries, powder-mills, and "other establishments for the manufacture of warlike implements "sprang up as if by magic," but the South failed in having no skilled mechanics, and, as a rule, they had to engine their vessels with make-shifts from land engines, nor, when completed, had they a seafaring population to man them, which accounts for their naval disasters.

I think we may all here, men of war as most of us are, lament the perversion of so much energy and talent to the arts of war; the arts of peace never received so much attention or made such progress in the same space of time. The moral, however, I am about to draw from this is, that with the number of eminent firms we have in this country, skilled in iron and ironclad shipbuilding, our Government have only to make up their minds what course they intend adopting in regard to attacking forts, &c., of any nation we may be at war with, and be prepared to rapidly run up, as the Northerners did, light draught ironclads, adapted for the special work.

I am sure Mr. Scott Russell, from whose clear practical speeches in this Institution, many of us have gained useful information, will guarantee, in six months, any amount of light draught vessels our naval leaders may require for any special work; as to torpedo boats we know that we can obtain ten for one of any other nation. The great resources of our dockyards will probably be fully taxed to maintain the cruising fleet in a state of efficiency. Our private firms can supplement those resources to any extent that may be required.

It will be no use attacking with inadequate forces and scant supply of ammunition, as we did at Sweaborg in 1855. It will not be worth while attacking any place it is not intended to capture, and in these days naval attacks will closely resemble a military siege, that is, will occupy time and great consumption of ammunition, nor must one or two repulses dishearten us, we must succeed in the end.

The groundwork of the facts I am now going to bring before you, relative to the conflicts of ships *versus* forts, is mostly taken from a "History of the Navy during the Rebellion," written by the Rev. C. B. Boynton, a Professor in the Naval Academy and Chaplain to the House of Representatives, from official documents. The historian's original remarks are, in my opinion, a great contrast to the modest, unassuming, matter-of-fact despatches of Farragut, Porter, Du Pont, Foote, men of world-wide reputation, and others too numerous to mention, but his work I advise all here to read for the novel and practical information it contains. I think it ought to be supplied to every Commander-in-Chief, and to every ship if procurable, and even our officials might gain valuable information, on the means adopted to keep health, comfort, and content amongst the crews employed on



the various arduous duties on an enemy's coast for long periods. I have also consulted Von Scheliha's "Coast Defence," Report of Secretary of the Navy on Armoured Vessels, and a paper on the "American Navy," in this Institution, of June 1st, 1868.<sup>1</sup>

The conflicts of ships against forts may be divided into two classes. First, those of wooden ships armed with old-fashioned smooth-bore guns, of 11, 9, and 8 inches calibre, supplemented eventually by rifled 150-pounder guns, against forts built of brick or stone before the war (which practically were found useless against the fire of the ships), and earthworks armed similarly to the ships. Secondly, those in which the new ironclad ships attacked earthworks and other forts constructed on new principles by the Confederate engineers when they found how easily their earlier batteries were taken.

The first important naval expedition was against the forts at Hatteras Inlet, which commanded the main entrance into Pamlico Sound. This and Albemarle Sound were the basins into which the numerous rivers of North Carolina emptied themselves; and by this network of sounds, rivers, creeks, bayous, connected with several lines of railway, the Confederates were enabled to transmit the warlike supplies brought by the numerous blockade runners from Nassau, Bermuda, and other ports; also to send away the cotton with which they paid for those supplies. That they realized the advantage they possessed, is shown by the earthworks they constructed at Roanoke and Ocracoke Islands, and at other points in the river too numerous to mention in this paper. At Hatteras Inlet, Fort Hatteras mounted 20 guns, and Fort Clarke 5 guns, size not mentioned, but probably 10-inch and 32-pounders, as similar guns were found spiked at Ocracoke Island, abandoned without fighting.

The fleet under Commodore Stringham consisted of two 45-gun steam frigates, "Susquehanna" paddle, 17 guns, three other steamers, and "Cumberland," sailing corvette of 24 guns, altogether 158 guns; 900 land forces were attached, but 300 only were landed, and they were unable to render any assistance.

This attack had to be made from seaward, and owing to shoal water, at distances from one and a half to two miles from the forts. It commenced at 8.45 A.M., August 28th, 1861; the "Wabash," 45 guns, towing the "Cumberland" in towards Fort Clarke, which was half a mile nearer than Fort Hatteras, followed by the flag-ship and other vessels. "These vessels passed and repassed Fort Clarke, pouring in "a continuous storm of shot and shell, the firing of the garrison being "wild and irregular, their shot falling over and around the ships." No mention is made of their being struck or of any casualties. The ships did not follow in one another's wake, and varied the distance from the forts on each passage, rendering it almost impossible for the batteries to get the correct range. At 12.30 P.M. Fort Clarke was abandoned. The "Monticello" was sent in to take possession, but owing to shoal

<sup>1</sup> "The American Navy; its organization, ships, armament, and recent experiences." By J. Randolph Hamilton, late C. S. Navy. See Journal of the Institution, vol. xii, p. 243, *et seq.*

water, grounded, and had to come out, the Commander observing—"We were about fifteen minutes in this *tight place*, during which time "we fired thirty shells." They were struck by five shots and one shell, sustaining no particular damage.

At 6.15 P.M. the engagement ceased for the night, recommencing at eight next morning, and by eleven, Fort Hatteras surrendered. "The "fire this day was very accurate, the range being two miles." The garrison could not stand to their guns, and took shelter in the bomb-proof; at length a shell struck a ventilator on the bomb-proof and went through; it did not explode, but created a panic, and as another exploded on it, it was evident that the magazine was not safe, and the white flag was run up, and the fort surrendered to the Navy, the Governor refusing to do so to the troops, who had taken no part in the fight. "This "was the first important experiment of the war in engaging earth-works with ships, and the result was awaited with no small anxiety "by those who had planned the expedition."

Commodore Stringham and his followers were highly complimented by the Navy Department for the skill displayed, but as there was not a heavy butcher's bill, the feat was thought little of by the country at large.

This was a fair fight between wooden ships, having about seventy guns on a broadside, engaging the twenty-five of the earthwork batteries, probably of a similar nature, as the Confederates had obtained very large supplies of naval guns when they took possession of Norfolk Navy Yard; and as the distance was one and a half miles, it was against the ship. The successful result, in my opinion, is owing to the superiority of shell-fire. Had solid shot been used, the earthworks would scarcely have suffered.

The next engagement of importance was the capture of Port Royal, a splendid harbour in South Carolina between Savannah and Charleston. The combined expedition was commanded by Admiral Du Pont and General Sherman; including transports, 50 steamers sailed from Hampton Roads October 29th, 1861, 25 colliers having been dispatched the day before. A very heavy gale scattered the fleet, but at 8 A.M., November 4th, most of the ships had arrived off Port Royal bar—a formidable one at all times, but still more so then, as the buoys and channel marks had all been destroyed. By the skill of the surveyors, however, the passage was soon rendered practicable, and the whole fleet safely anchored in Port Royal roadstead by the evening of the 5th, and the forts had been reconnoitred. These were Fort Walker on the south shore at Hilton Head, mounting 23 guns, two of which were 6-inch rifle and one a 10-inch shell gun; Fort Beauregard, on the north shore, mounted 20 guns, some 6-inch rifles, one 10-inch, one 8-inch Columbiad; the remainder of the guns were most likely 32 and 24-pounders. The rifled guns were probably manufactured in the South, since the war commenced in April. These forts were two and a half miles apart, consequently could not be engaged at the same time, except at long range.

The main squadron consisted of "Wabash," 45 guns, "Susquehanna," 17, three sloops, three gunboats, and a sailing sloop, mounting in all

about 100 guns; the flanking squadron consisted of six gunboats, mounting about 18 guns.

Every preparation having been made, the fleet weighed anchor at 8 A.M., November 7, and formed line ahead in close order, the "Wabash," flag-ship, leading; the forts opened fire about 9.25; the fleet replied, passing into the harbour midway between the two forts, engaging both at long range. When two and a half miles above the forts, the fleet turned to the southward. At 10.15, signal for close action was made, and the "Wabash" passed Fort Walker at a distance of 800 yards, when abreast of it, the other vessels following, pouring in a destructive fire; at the second round, the ships passed within 550 yards, thus throwing out the aim of the land gunners, while some of the gunboats took up an enfilading position, adding to the confusion of the garrison. Having come down from the north and delivered its fire, each ship went round and approached the fort on a different line; on the third round of the ships, the fort was abandoned, the garrison seeking shelter in the woods. At 2.20 P.M. the Union flag was hoisted in Fort Walker, and at sunset it was discovered that Fort Beauregard had also been deserted. The forts thus taken by this wooden fleet alone were earthworks, built since the commencement of the war, and probably by good engineers; and yet Fort Walker, mounting 23 guns, supported by Fort Beauregard, succumbed to the fire of a fleet mounting between 50 and 60 guns on each broadside engaged, six rounds from each in reality doing the business. The ships sustained no damage as far as I gather from the history; but Colonel Fletcher mentions they had thirty-two killed and wounded. So great was the panic occasioned by these successes of wooden ships against forts, that extensive works constructed to protect Fernandino, an important port in Florida, were abandoned. Admiral Du Pont reports they were as complete as art could make them. There were eight or nine forts altogether thus abandoned to protect a very crooked and shoal river. Many other forts built to protect important rivers or towns in the vast network on the Atlantic coast were also abandoned. There were also numerous engagements between extemporised gunboats converted from ordinary wooden traffic steamers, totally unprotected, and heavy batteries in these inland waters, in which, as a rule, the gunboats won the day; to mention them all, however, would be beyond the limits of a paper, so I will now proceed to narrate the exploits of the Gulf of Mexico squadron under Farragut, in attacking the forts on the Mississippi till he formed a junction with the Upper Mississippi squadron above Vicksburg, to the exploits of which I will then turn your attention.

On the 20th January, 1862, Admiral Farragut was appointed to command the Western Gulf of Mexico blockading squadron, with directions to take New Orleans. The naval force consisted of the "Colorado" and "Wabash," 40-gun frigates; these it was found drew too much water to cross the bar; three large corvettes, the "Hertford," "Brooklyn," and "Richmond," of 21 guns each; "Mississippi" and "Pensacola," paddles, and thirteen smaller vessels, the whole mounting about 150 guns. In addition, twenty-one mortar schooners



were attached, with several steamers to tow them, under Commander David Porter, who in less than nine months was Acting Rear-Admiral commanding on the Upper Mississippi.

Farragut arrived off the river on the 20th February, and the work of getting the ships over the shoal bar commenced, which occupied nearly two months, as several of the larger ships had to be cleared of everything and fairly dragged through the mud. Great importance had been attached by the Navy Department to getting the frigates over the bar, as "the tops of these large steamers are from 30 to 50 feet above the forts, and command the parapets and interior completely with howitzers and musketry." The draft of water of these ships was given, to show how carefully considered the expedition was; even the number of tons to be removed to lighten an inch is given in the orders.

The Confederates had made great preparations to resist the attack. Fort Jackson, on the west side of the river, mounted 75 heavy guns, including rifles and 10-inch Columbiads. Fort Philip, on the other side of the river, which is here about half a mile wide, mounted 25 guns; the flotilla consisted of thirteen armed steamers,<sup>1</sup> the steam battery "Louisiana," 16 guns, either not engaged or it was disabled, and the ram "Manasses." A very strong barrier was also thrown across the river within point-blank range of the forts, and the defences, certainly judging from precedent, appeared to justify the confidence of the defenders in their repulsing the assailants.

The mortar vessels bombarded the forts from the 18th April to the 23rd, when it was decided to make the attack that night (an opening had been previously made in the barrier). At 2 A.M. the signal was made to weigh, but owing to the strong current and the difficulty always experienced in getting a large number of vessels under weigh simultaneously, it was not till 3.30 a general move ahead was made, when all went forward as rapidly as they could; the Confederates not being idle, the forts opened fire, the shores were lit up by fires (which I am inclined to think were on the whole as advantageous to the fleet as to the batteries), fire-rafts were sent down, one of which set fire to the flag-ship. The leading vessels replied to the forts, into which a shower of bombs was sent by the mortar schooners; the smaller steamers poured shell, grape, and canister into the water batteries, driving the men from their guns.

The result was, the forts were passed, the loss to the fleet being the "Varuna," a converted merchant vessel of 800 tons, sunk by a ram, 47 men killed, 137 wounded; total 184; and the fleet was struck 165 times, as the "Brooklyn" was hit by 16 shot and only one shell I believe the Confederates were not well supplied with shell. "Pinola" was also hit by 12 shot. The Confederates had 52 killed and wounded, according to Pollard.

"Thus," to use the words of the historian, "was fought and won the greatest naval battle of the war, which was probably the boldest and most successful effort ever made to match wooden ships against

<sup>1</sup> According to Pollard only eight were armed, and "Louisiana's" engines were useless.

"forts at close range, armed with heavy guns, both rifled and smooth-bore, and when, in addition, the forts were assisted by ironclad rams and a fleet almost as numerous as our own," although "doubtless inferior in strength and endurance to it." And when we consider the great authorities who at that time were strongly of opinion that an attack by wooden ships against forts was hopeless, I am sure you will all agree with me that Farragut ranks in the first class as a naval commander. The river was there only half a mile wide; the current runs three or four knots, and with the usual eddies at a sharp bend, as was the case here. The Mississippi also is liable to sudden fogs coming on; in my own ship ascending it, such happened, when the pilot instantly dropped anchor, so that the passage of a fleet by night, unresisted, would have been no light undertaking.

The result of this battle was the surrender of the forts, the capture of New Orleans, and the command of the Lower Mississippi, which cut off the south-eastern portion of the Confederacy from the unlimited fresh supplies from Texas. It was by far the greatest blow the Confederacy sustained in the first year of the war, and at the trifling cost of less than 200 killed and wounded, one hired steamer sunk, and the total damage sustained by the rest of the fleet not being equal to the sinking of another steamer. The "Mississippi," a formidable ironclad, which the Confederates had been unable to complete, was burnt; this vessel was intended for a sea-going ship, with which it was hoped the hostile fleet would be destroyed, and the Atlantic coast cities laid under contribution. Another ram was also sunk off the Custom-house; and an immense quantity of cotton and other stores were burnt.

Up to this period, a little more than a year after the war commenced, we find the forts at Hatteras and Port Royal (earthworks quite recently constructed), and those of masonry in the Mississippi, below New Orleans, with that city itself, taken by the Navy with wooden vessels alone; all these, however, were water batteries, with which ships are on more equal terms than when the forts are placed considerably above them. Moreover, they had no troops in the rear to prevent the forts being occupied by the Navy when silenced by its fire, and the garrison driven out; nor could troops approach, except by sea. Higher up the river, forts were placed on more elevated ground; and, when silenced by the superior fire of the fleet, the men withdrew, firing again as soon as the fleet passed them: for although silenced, they were not disabled, and they had troops in the rear too numerous for the Navy to be able to take possession.

The country and Navy Department, misled by the capture of Forts Jackson and Philip, under very different circumstances, ordered Farragut to attack Vicksburg. "This town is in a sharp bend of the river, and its batteries so placed as to expose a vessel to a raking fire as soon as it came within range, then to a direct fire from the water batteries when abreast the city, and a plunging fire from the guns on the bluffs, and then to a raking fire till out of range." The batteries were placed at the water's edge, half way up, and at the top of the bluff, 300 feet above the river, all earthworks, constructed mostly

since New Orleans was captured. The current was probably three or four knots, and the ships did not steam more than eight or nine knots. The attack commenced at 4 A.M., June 28th, 1862; the attacking force consisted of 14 wooden steamers and 16 mortar schooners; the latter during the previous day had bombarded the defences. Two-thirds of this force passed the forts, having been an hour and a half under fire, "as the batteries extended for a space of three miles" (Commander Porter's Report). 17 men were killed and 30 wounded. The flagship was hulled nine times by shot, and her rigging rather cut up. The "Oneida" was struck by three shots and one shell, the latter doing much more damage than the three shots. "Richmond" struck also by three shots and one shell, the latter doing most damage. Other damage is not given in detail; but it appears to me that the Confederates made but little use of shell, or, if they did, the powder was bad, as on the previous day a shell had lodged in a mortar vessel, which did not explode. It is curious that so little damage was done by the fire of forts scattered over a long distance, thereby preventing a concentration of fire from the ships on any one, and in a narrow river. Not having any Confederate account, the damage done by the fleet cannot be ascertained. One thing, however, is certain, as reported by Farragut, "the forts can be *passed*, and we have done it, and can do it again as often as may be required of us, but without a land force they cannot be taken." That this was not an idle boast is shown by his passing these forts again on July 16th, the object being to destroy the Confederate ram "Arkansas," armed with six rifled guns. This vessel the previous day had come out of the Yazoo river, defeated two Federal gunboats and a ram, ran the gauntlet of the combined squadron of Farragut and Davies from the Upper Mississippi, which had effected a junction just above Vicksburg, and probably numbered 14 or 16 vessels, heavily armed, several being ironclads, inflicted on them a loss of 18 killed and 60 wounded, losing herself 5 killed and 9 wounded, according to Colonel Fletcher (who also mentions she was manned by soldiers), and reached the protection of Vicksburg.

So dashing an affair, and so heavy a loss inflicted in a quarter of an hour by a single vessel, not unnaturally determined Farragut to attempt her destruction. With this object in view, his fleet weighed at 6.40 P.M.; the action with the batteries commenced about 7.20, and ceased at 7.50, being so near, that muskets were used as well as great guns. Owing to the darkness of the night, however, the ram could not be made out, being close in under the bluff, and hidden by its shadow. In this passage, during which some of the ships stopped engines and drifted down, the flag-ship was hulled several times, once by a shell which *did not explode*, and other vessels were struck. The "Winoa," by the first shot that hit, sprang a leak, which, after passing the batteries, compelled her being grounded, to repair it. A shell burst, killing one man and wounding two slightly. Total number of killed and wounded in fleet is not mentioned; but Admiral Davies reports it as "wonderfully small, and must be attributed to the rapid and well-directed fire from his (Farragut's) ships, by which the guns of the enemy were silenced as soon as reached."



On the 22nd July, another attempt was made to sink the "Arkansas." The "Essex" ironclad, from the upper river squadron, and "Queen of the West," a very fast river steamer, specially strengthened for ramming, were sent down the river, while, to distract the garrison, the mortar vessels opened fire. The "Queen of the West," was so shattered by the fire from the batteries that she had difficulty in regaining the anchorage. The "Essex" ran full speed at the ram, but, owing to her having cast off her bow-line, failed and ran aground, lying there under a heavy fire for ten minutes, when she backed off and passed down to the fleet (as reported by Farragut) "through a storm of shot and shell, and, strange to say, not a shot struck her" after she left the upper forts, she was only struck by two shots and "one shell; the latter exploded inside the casemate, killing and wounding three of the crew."

The "Arkansas" was eventually destroyed off Baton Rouge, where, owing to her engines breaking down, she was run ashore and set on fire, either by her own crew, or by the fire of the "Essex," as Captain Porter supposed; so ended her career, in less than a month after the slaughter she had inflicted on the Northern fleet.

The next work performed by Farragut and his wooden fleet, was passing, March 13th, 1863, the batteries at Port Hudson, which is situated on one of the short curves of the Mississippi, round which the current runs very strong. The historian gives no details of the batteries; but Von Scheliha remarks, that they formed a system of works superior to those of Vicksburg. The fleet consisted of three heavy corvettes, to each of which a gunboat was lashed on the port and off side, the "Mississippi," paddle, 17 guns, and a small gunboat. The "Essex," the ironclad from the Upper Mississippi squadron, was placed so as to enfilade the batteries, and there were four mortar schooners. The fight commenced at 11 P.M.; the flagship and her gunboat passed the forts successfully, although she grounded for a short time, without sustaining any great damage or loss of men. The "Richmond," the next ship, had passed the curve, and was engaging the last battery, "when a shot struck the steam-pipe in the vicinity of the safety-valves, upsetting them both, and letting off the steam," and she was compelled to drift down the river, having been struck by twelve shot and two shells, 3 men killed and 12 wounded (the ship was ready for work next day, with reduced steam). The third ship got up to the turn, where she grounded, and remained there under a heavy fire for some time, and, on getting off, the engines were disabled by hot bearings, and she also failed, losing 6 killed and 21 wounded; being not only hulled repeatedly, but much cut up in spars and rigging. The "Mississippi," the last ship, also reached the turn, and up to the last batteries, when she grounded and remained immovable, and up to this time does not appear to have sustained much damage; but, becoming a target to several batteries which got her range, to avoid being captured she was set on fire and abandoned, sustaining a loss of 64 killed, wounded, and missing, out of a crew of 297; and as they only had three small boats to land the men on the opposite side of the river, from which musketry had been fired against

them ascending, it is evident the crew were cool and under good discipline. Although only the flag-ship and her gunboat succeeded in passing the batteries, it is evident the others would have done so, had it not been for the disablement of the engines in two of them, and the unfortunate grounding of the fourth vessel, as they had all nearly reached the upper batteries and the turning point without having suffered much from the enemy's fire, owing perhaps to Farragut's orders, as follows:—"I think the best protection against the enemy's fire is a well-directed fire from our own guns, shell and shrapnel, at a distance, and grape when within 400 or 500 yards."

Farragut, with his small force, did great damage to the steamers and flat boats crossing the Mississippi from Texas to the eastern shore; but his crews had to be kept in readiness night and day, to repel ram and torpedo attacks. He also had constant brushes with small batteries, in one of which, against four small guns, he had two killed and six wounded from shell which did not explode, and did not always escape loss in others.

In all these actions topsail, foresail, jib, and spanker, were kept bent—ready for use in the event of the engines being disabled—but I do not read of any vessel's screw being disabled or stopped even temporarily by any of her own gear (or any other), although spars and rigging were occasionally shot away or damaged, and one vessel lost her three masts—but I imagine only light spars for fore and aft sails. Nor did Farragut lose one of his wooden vessels from the fire of forts. Farragut's orders are concise and to the point, and useful hints are to be obtained from them. It is evident he was a leader who consulted with his Captains, decided on his plans, which were settled beforehand, and had thorough confidence in his subordinates, who appear to have had the fullest faith in him. In his general order for the river work, guns are to be mounted on poop and top-gallant fore-castle, so as to have as much right ahead and astern fire as possible. Boat's howitzer in tops; ships to be trimmed by the head, to avoid swinging head down stream, if grounded; light Jacob's ladders ready for carpenter in stopping shot holes. Among the devices adopted was whitewashing deck, guns, carriage, and even block, which was found a great advantage in a night action; and other hints too numerous to mention here.

I will now turn your attention to the work performed by the Upper Mississippi squadron, mostly in the ironclads I have already mentioned as constructed there by Mr. Eads, of St. Louis.

On September 6, 1861, Commodore Foote assumed the command of this squadron, then consisting of 3 wooden vessels in commission; 9 ironclads, and 38 mortar boats building; there was no navy yard to procure supplies from, or any convenience for fitting out a squadron; but as the Secretary of the Navy reports to Congress: "All difficulties were surmounted by this energetic and able officer, whose perseverance and courage in overcoming obstacles in creating a river navy were scarcely surpassed by the heroic qualities displayed in subsequent well-fought action on the deck of the gunboats he had under so many discouragements prepared."

Early in February, 1862, the ironclads were first seriously tested,

in the capture of Fort Henry on the Tennessee river. It was a regularly constructed earthwork, mounting 17 guns, 1 10-inch smooth bore, 1 24-pr. rifle, 12 32-prs., 1 24-pr., and 2 12-prs.; it was situated at the end of a long reach two miles in length. A battery of 2 64-prs. on a neighbouring eminence commanded the work.

The attacking flotilla consisted of 4 ironclads, 3 of 13 guns, 1 of 9; each vessel firing 3 guns right ahead and 2 astern; and 3 wooden gunboats, mounting 9 guns each.

At 10 A.M., February 5th, the four ironclads, in line abreast, advanced to the attack, followed by the wooden gun-vessels some distance astern also in line abreast. Little firing occurred till within a third of a mile of the fort, when the flag-ship delivered her fire, followed by the bow-guns of the three consorts; 11 guns from the fort replied with "an accuracy of aim that proved the value of the gunboats' " armour, as they were repeatedly struck." The action at close quarters lasted an hour and a quarter when, having 7 guns out of 11 disabled, and one-third of the garrison killed and wounded, the fort surrendered to the Navy; the Army, owing to a muddy road, not coming up till an hour afterwards. The flag-ship was struck 31 times, "Essex," 15, "St. Louis," 7, and "Carandolet," 6 times; the wooden vessels were not struck. Altogether 59 hits; casualties were 2 killed, 9 wounded, and 28 men scalded by an escape of steam in the "Essex," from a shot in her boiler, which entered one of the ports.

Commander Foote next attacked Fort Donalson, on the Cumberland River, a much stronger position, having 20 guns bearing on the squadron; one battery was 20 feet above the water, a second, 60 feet, and a third, on the summit of the bluff, 150 feet above the river, mounted a 128-pr.; the lower batteries mounting 32 and 64-prs. Four ironclads and two wooden gunboats attacked the fort, February 14th, the army co-operating. Fire was opened when about a mile distant, and a steady advance made till within 400 yards, when shot and shell from the fleet dismounted the guns, and drove the gunners from the lower batteries, not, however, before serious damage was done to the ironclads, three being disabled in the steering gear, compelling them to drift out of action. The Commodore, from the slacking of their fire thought that in another quarter of an hour the forts opposing the fleet would have given in; but as the forts opposed 20 guns to the 12 bow-guns, which the ironclads could only use (without having the Confederate statement), that point admits of doubt, particularly as 11 men were killed and 43 wounded in the vessels; the flag-ship was struck by 59 shots, had 2 killed and 9 wounded; the "Pittsburg" by 40, and the "Carandolet" by 35 shots, from 128 prs. to 32 prs., having 4 men killed and 32 wounded, while the "Pittsburg," although struck oftener, had only 2 men wounded—such are the chances of an engagement. The fourth ironclad was also struck, but number not mentioned; her steering wheel, however, was disabled, and she had 4 killed and 5 wounded; so I think we may infer she was struck 30 times.

These four vessels were struck 164 times in an action of two and a half hours against 20 guns; Farragut's fleet, in passing the forts below New Orleans, opposed to 100 guns ashore, and about 50 in the



flotilla, being struck 163 times. The forts surrendered next day to the Army; and Army and Navy in conjunction cleared the river of forts and hostile gunboats, till a junction was effected with Farragut's squadron above Vicksburg, where the conflict with the ram "Arkansas," already mentioned, occurred.

The ironclad squadron in November, 1862, was placed under the command of Acting Rear-Admiral D. Porter, who as Commander Porter in charge of the mortar vessels had so much contributed to the success of Farragut's passages of fortified positions. On the 16th April, 1863, 7 ironclads, and 5 or 6 transports, passed the forts off Vicksburg at midnight, which had been considerably strengthened since Farragut passed down. They were two and a half hours under fire; one transport was burnt, another seriously injured, 12 men only were wounded; one ironclad was struck by nine round and rifle shot. Transport "General Price," was struck by 13 shot and shell, two of the latter exploded inside, and set the ship on fire; besides musket balls, 3 men were wounded. Other ironclads were struck by 23 shots, no mention being made of shell, and were not much damaged.

On the 29th April, Grand Gulf was attacked "with only partial success." This was a fair stand-up daylight fight, lasting from 8 A.M. to 1 P.M., between the same squadron and "four batteries of heavy guns, placed a quarter of a mile apart on high points commanding the river;" in all, mounting 13 heavy guns, mostly rifles, and some field pieces. All the ships suffered heavily; the flag-ship was struck 47 times, and had 7 men killed, 19 wounded. "Lafayette" hit by 40 shot, "five only did serious damage," and only one officer slightly wounded. "Tuscumbia," early in the action, was struck by a shell on the outer edge of the port shutter, which "opened it," entered the turret, exploded inside, killing 4 men, and wounding "several." "Another shell struck both shutters of the same port, jamming them so that they could not be used; another shell entered the after turret and exploded, disabling every man but one at the gun." "The ship was struck 81 times by shot and shell," besides grape and shrapnel; 5 were killed and 24 wounded. "Mound City" silenced batteries opposed to her after four hours' firing; lost no one, and received no damage worth mentioning. "Carandolet" not injured; "Pittsburg" was struck 35 times; had 6 killed and 13 wounded.

The Admiral reports: "All the Commanders fought their ships gallantly, and I think effectively.

"All the vessels did well, though it was the most difficult portion of the river in which to manage an ironclad, current six knots, and strong eddies turning them round.

"It was a hard fight, and a long one on both sides. The enemy fought his upper battery with a desperation I have never yet witnessed, for though we engaged him at a distance of 50 yards, we never fairly succeeded in stopping his fire but for a short time. It was remarkable we did not disable his guns, but though we knocked the parapet to pieces, the guns were apparently uninjured." It was indeed a severe action, three of the ironclads being struck 163 times,

and having 18 killed and 56 wounded, while it is curious the "La-fayette," although struck forty times, had not one wounded. Between 7 and 9 P.M. the same evening, the fleet protected the passage of the transports down the river, and were engaged an hour and a half; struck about a dozen times; one man was killed; other damage done not worth mentioning.

Here again we want the Confederate account, to enable us to arrive at a just conclusion, as the forts were abandoned (owing to the Northern Army getting into their rear), and taken possession of by the Navy; ruined, according to Porter's account, which, however, hardly seems to agree with the fact, admitted by himself, that the fire was not silenced in the morning fight of five hours, and also his vessels were struck when passing down in the brief night action.

The next action I shall describe is Farragut's passage of the defence to the entrance into Mobile Bay, defended by Fort Morgan, originally a brick structure, supplemented according to the recent experience gained by the Confederate engineer, by sand batteries, &c., mounting 136 guns, and a line of torpedoes extended partly across the channel. Here great additions were made to the original masonry defences, while, with the exception of four monitors, the attacking force was no stronger than in the passage of Forts Jackson and Philip, two and a half years previously.

The "Tennessee," a powerful Confederate ram, plated with 6-inch iron, armed with six rifled 6 and 7-inch guns, and three gunboats, about a match for the same number of Farragut's gunboats, lay inside the defences, ready to attack the Northern fleet, as it was presumed they would be seriously injured or disabled in passing such formidable defences. The fleet consisted of five corvettes, mounting 20 guns on an average, and three mounting 16, each having an attendant gunboat lashed on the port or off side from the batteries, and the four monitors were placed in-shore. On the engaged broad-side therefore the Federals opposed 74 guns to the fire from the batteries, mounting, as already mentioned, 136 guns. I cannot, however, ascertain how many bore on the channel; but as the passage had not been attempted sooner, there must have been a considerable number, as so dashing a leader as Farragut declined attacking without monitors. I don't think I am overstating the case when I allow at least 50 guns; and as all the ships' guns could not bear at once, in this instance I do not think their fire was superior in point of numbers to that of the defence, supplemented as it was by a raking fire from the "Tennessee" and her consorts. Farragut, as usual, relied on the rapidity of his own fire as the best defence against the enemy; not to fire till they did, then use shell and shrapnel; grape when within 400 yards. Gun crews on poop, forecastle, and in tops, were to be removed when within grape range, till passing it. His Flag Captain reports after the action, "The rapidity of our fire, together with the smoke, so completely disordered the enemy's aim—we passed the fort with no great injury or loss of life—a shell, which exploded, killing and wounding a large number of men at No. 7 gun."

The action commenced at 7 A.M., August 5th, the "Tecumseh"

leading monitor, about 300 yards on the starboard bow of the "Brooklyn" leading; the wooden line was blown up by a torpedo; the "Brooklyn," to avoid others, stopped and backed, and would have clubbed the fleet, when defeat would have been inevitable, but for the prompt decision and judgment of Farragut in the second ship, who dashed ahead, despite of torpedoes, full speed, followed by the whole fleet, and by 8 A.M. the fleet were anchored inside the defences, and beyond their range.

It appears to me that a disastrous defeat was converted into victory by (in so unexpected a contingency) the quickness of eye and power of rapid decision Farragut possessed, which saw at a glance the only escape from the dilemma the fleet were placed in, and which can only be acquired by a thorough practical knowledge in the management of fleets, and for want of which no amount of theoretical knowledge, however desirable in many respects, can make up for in the moment of difficulty.

The fleet were scarcely anchored when the "Tennessee" was seen advancing to the attack (the other gunboats had been previously disposed of), and now commenced a fight unprecedented in its nature—one ship against nine, three of them monitors. The unequal fight lasted from 8.45 to 10 A.M., when the "Tennessee" surrendered, her steering gear being disabled, funnel shot away, the Admiral and six men wounded and three killed, and the rest of the crew "half suffocated" by the smoke, half stunned by the ramming of the wooden ships, "and blinded by the *blast of bursting shell*." One monitor, armed with a 15-inch gun, was the only one whose shot penetrated the armoured casemate of the "Tennessee."

The total loss of the Northerners that day (exclusive of the 120 blown up in "Tecumseh") was 52 killed and 170 wounded—48 killed and 136 wounded being in the four leading ships, which also bore the brunt of fight with "Tennessee." There were no casualties in the monitors. At least two-thirds of this loss was caused by the ram and gunboats, Farragut reporting "we lost many more men from their fire than from that of the batteries of Fort Morgan."

They were only struck by 120 missiles; for the number of hits, therefore, the casualties are greater in proportion than in any previous action of Farragut, and which I attribute in great measure, as was the case, to the "Tennessee" and her consorts using shell. In a paper written by Captain Cyprian Bridge, on "Naval Attack on Fortresses," he gives a passage from *Lessons of War*, quoting the high authority of Sir William Jervois, R.E., that "a fort is able to inflict far greater damage on its assailants than the latter can inflict on it, whilst it will hit the assailant nearly every time; the chances of the assailant hitting it more than once in the same spot are small. Further, one shot may send a ship to the bottom, whilst the fire from a ship during action is more or less inaccurate." I can only imagine this opinion to be purely theoretical.

And now for some of those stubborn facts which so frequently annihilate theories. The "Tennessee" in an hour and a quarter killed and wounded over 100 men, which is giving credit to the fort and her



consorts for the remaining 84, and I believe, from the reports, I am within the mark. The "Arkansas" ram, as I have already mentioned, killed and wounded 78 in less than a quarter of an hour. The "Albemarle" another Confederate ram, with only two guns, one of which had its muzzle shot off, engaged eight wooden gunboats for three hours. "Many men were killed, wounded, and scalded on board the Federal ships (one of which was disabled)." The actual number is not given. The "Alabama" sank the "Hatteras" in half-an-hour in a night engagement; was herself sunk by the "Kearsage" in an hour and quarter, having 9 killed and 24 wounded, the "Kearsage" being hit 28 times—both ships in rapid motion. The "Weehawken" monitor at sea fired five shots at the "Atlantic" Confederate ironclad, four of which struck and decided the action in a quarter of an hour. The "Merrimac" struck the little monitor 28 times, and was repeatedly struck by the monitor's two guns—both vessels in motion. I have traced the loss of twenty-three Federal vessels during the war, three only were sunk by fire of batteries when afloat, and three captured by artillery fire when aground in narrow rivers, while six of them were captured or destroyed by Confederate vessels, five were blown up by torpedoes, and for one engagement with ships, there were fifty or more with batteries.

Now, for the fire of batteries against ships, and *it must be remembered in narrow rivers with strong currents* and marks on the opposite shore to guide the gunners. In addition to the actions I have already described, Captain Ward, in a paddle steamer of 250 tons and three guns, with two smaller consorts of each two guns, the largest a 32-pounder, engages batteries in Acquea Creek, and was struck several times but sustained little damage, reports more than 1,000 shots were fired at them within range.

In the combined siege of Port Hudson, the "Essex" ironclad, 9 guns, was engaged repeatedly from 23rd May to 26th June with batteries mounting two 10-inch, two 8-inch Columbiads, and two rifled 6-inch guns. "During these engagements 'the batteries were silenced and 'men driven from them three times.' 'Essex' fired 738 shells, and 'mortar vessels 2,800 shells. It was estimated 1,000 shot and shell 'were fired at 'Essex,' twenty-three struck her hull, and her awnings 'and windsails were cut up—casualties, six wounded.'" Comment is as unnecessary as it would be to give the many more similar facts I could bring forward, while I have given the worst done by batteries as far as I have ascertained. Mr. Goschen, as every one probably remembers, stated in the House of Commons that he was informed by an eminent authority that it would take 300 hits to reduce the "Inflexible" to the well-known "riddled and gutted condition." From these facts we can all judge how very improbable such an event would be, and how many shots must be fired before she would be struck so often.

I have not alluded to the attack on Charleston and Fort Fisher, as they were more regular sieges; nor does space permit of the narrative of many other most interesting events in the war; but I must briefly allude to the extraordinary escape of Admiral Porter's fleet from the Red River, up which he had ascended to support the Army, and on

their repulse and retreat found himself above the falls of Alexandria with the river falling instead of rising, and the Confederates turning the course of streams that fell into the Red River. Porter saw no alternative but to destroy his vessels and retreat with the Army, when Colonel Bailey, the engineer of the 9th Corps, proposed building a dam across the river above the falls so as to raise the water sufficiently to float the vessels over the rocks. Ridiculous as the plan appeared to most of the engineers, it was adopted and succeeded. It was in undertakings like this that the previous civil life training of the greater part of the Federal Army gave them advantages no European Army could possess. Amongst the Army were three regiments of lumbermen from the State of Maine, who soon cut down timber sufficient, and the resources of the whole Army were at Colonel Bailey's disposal, who evidently must have had previous experience in damming rivers, and in ten days did what Porter states would have taken any private company a year to do. So far I have mostly given facts about which there can be no dispute; but as different conclusions will most likely be drawn from them, I shall now proceed to give my own observations. However, for want of Confederate accounts, I am more in the position of a lawyer advocating his client's cause than of a judge summing up after hearing both sides. It is evident, as the Federals were eventually successful in nearly all their attacks on forts, that there must have been a weak point in the Confederates' armour, and one, and a very material one it appears to me, was that they used *solid shot* while the Federals used *shell*, shrapnel, grape, and canister almost entirely.

In many actions the expenditure of ammunition is given. At Grand Gulf, of which I have given a brief account, the expenditure of the flag-ship was 337 shells, and 8 solid shot; "Lafayette" 248 shells, another vessel 418 shells, two others report 429 and 216 rounds, projectile not named. The squadron was struck 163 times, but mention is only made of three or four shells.

The "Tuscumbia" was struck 81 times. One rifle shell struck a port shutter, opened it, exploded inside the turret, killed four and wounded several men; another shell jammed a port shutter, preventing that gun being used for the rest of the action. I have already drawn your attention to the effects of some shells, and the damage done by them. One 7-inch shell from a Confederate vessel hit the "Massachusetts" five feet above the water-line; it cut through eighteen planks of the main deck, carried away tables, sofas, eight sections of iron steam-pipes; exploded in state rooms, stripping the bulkheads of four and setting fire to the ship. A fragment of the shell hit a timber, breaking all the outside planking from the main to the spar-deck, a distance of  $5\frac{1}{2}$  feet. Had it burst nearer the water-line, it is evident the ship must have gone down. From the accounts given of those hits by shot and shell, I believe I am much under the mark when I say for one shell, ten shots were fired by the Confederates, and on an average each shell did more damage than five shots when they did explode, which was often not the case. I have already mentioned Farragut's orders relative to firing shell, and in the many returns of ammunition expended in his squadron I scarcely find mention made of

solid shot. I was much struck with the remark relative to the capture of the "Tennessee" by Captain Hamilton of the late Confederate States Navy in a paper read here June 1st, 1868 (which I only recently obtained), viz., that the men were "blinded by the blast of bursting shell," which it must be remembered were 11 and 9-inch, with bursting charges of about 9 and 5 lbs. of powder, exploding outside the casemate, for none penetrated.

In the action between the "Alabama" and "Kearsage," Semmes, finding his shell did not explode, fired shot, and only wounded three men in the "Kearsage" by a shell which exploded, although she was struck twenty-eight times. The "Kearsage" fired in all 173 rounds, 55 of which were from her 11-inch shell guns, which killed 9 and wounded 24 of the "Alabama's" crew before she sank in consequence of the huge gaps made in her by the heavy shells from the "Kearsage." The Confederate shells were also of inferior manufacture, judging from the fact that of the comparatively few recorded as striking, several did not burst, although doing considerable damage as shot.

Another weak point evidently was the inferiority of the Confederate Navy, which, with the exception of the rams, mainly consisted of weak river steamers, scarcely protected against shell. At New Orleans at least six were set on fire by Federal shells. The "Brooklyn," of twenty 9-inch guns, mentions, after passing the forts, "we engaged several of the enemy's gunboats at short range, from 60 to 100 yards, the effect of our broadside must have been terrific." As no mention is made of the effects of the fire from the gunboats, I cannot but think they must have been inadequately armed; and as only about 250 naval Officers joined the Confederates, they at all events could not have been properly officered. Colonel Fletcher states most of these were equipped by the city of New Orleans, as well as the ram "Louisiana." They were manned by volunteers and under no discipline, and did not acknowledge the naval Officer, Captain Mitchel, sent to command them at the last moment. Porter reports there was great ill-feeling between them and the military at Forts Jackson and Philip. I must, however, express my opinion that they fought gallantly. At Fort Pillow, out of eight Confederate vessels two were blown up and one sunk by shell in less than an hour; and soon after, at Memphis, two were blown up by shot or shell in their boilers, one set on fire by shell. In these two actions only seven were wounded in the Federal squadron, two vessels damaged by ram, but none struck by shot, proof of the inferiority of the Confederates, except in numbers, while 300 shot and shell were fired against them at Memphis alone. Excepting the seceding Officers, the Confederates had not the nucleus of a Navy, and found it impossible to form one during the excitement of war; but their gallantry, as was to be expected from men of similar race, was not surpassed by the Federals, more especially when we consider they only met to be beaten. These weak points of the Confederates I gather from the Federal accounts. Many more would probably be obtained had we Confederate reports; and I cannot help thinking that had the Confederates used more shell and possessed



more efficient vessels, the Federals would have sustained very much more damage than they did, not that anything detracts from their merits; their plans were well and maturely considered. Mutual confidence existed between the leader and his subordinates, and dash, decision, and energy were shown at the right moment.

It may not be out of place here to mention, relative to a remark made by some one, that while the word glory is the most prominent one in Napoleon's despatches, duty is that in Wellington's despatches. I do not find the former word in the Federal despatches. Commander De Camp, after New Orleans, reporting the loss of five killed and twenty-four wounded, observes, "The highest praise I can bestow on the Officers is to say they all did their duty." Farragut's mentioning his second in command at Mobile, "as never forgetting to do his duty to the Government," adds, "he carries out the spirit of one of Collingwood's best sayings—'Not to be afraid of doing too much, those who are, seldom do as much as they ought.'"

Every commander of squadrons or ships reports in a similar manner.

The conclusion I arrive at from these facts, and others beyond the limits of a paper, are—

1st. Shell must be the rule against forts and unarmoured vessels, solid shot the exception. Shell demoralizes where it does not penetrate. If the men of the "Tennessee" were blinded by the blaze from the explosion of 9 and 11-inch smooth-bore shells, the probability is the explosion of 10 and 9-inch rifle shells, with bursting charges of 27 and 20 lbs. of powder, must have considerable effect on the crews of ironclads, even if they do not penetrate. In my opinion, founded on these facts, our present establishment of shell is insufficient for the demands that will be made on it; except for special circumstances, solid shot should not be used.<sup>1</sup>

2nd. In attacking forts under weigh, very close order must be kept. Farragut passing Vicksburg remarks—"If the ships had kept in close order, in all probability they would have suffered less, as the fire of the whole fleet would have kept the enemy from his guns a longer space of time, and when at his guns his fire would have been more distracted."

3rd. If hydrography permits, pass and re-pass the forts at various distances previously arranged, by which your own time-fuses can be fitted while the enemy will have difficulty in getting your range, ships not to follow in each other's wake, as at Port Royal, where the fleet escaped damage, while at Fort Donalson and Grand Gulf, where they could not vary their distance, they suffered considerably.

4th. A powerful ironclad navy, with numerous vessels of light draft, ought in time to capture forts isolated from the main land and unable to get in fresh troops, as was the case at Hatteras, Port Royal, Island No. 10, New Orleans, and other places not mentioned here.

5th. Water defences with an army in rear can only be taken by a

<sup>1</sup> Since writing this, I find the proportion allowed is much greater than it was.—  
R. V. H.

combined army and navy attack, as Vicksburg, Port Hudson, and others.

6th. A good corps of surveyors is essential, as Porter reports, and as our practical experience also tells us.

7th. In all coast defences against ships, naval Officers should be consulted on the position of the forts. Porter says—"Had the Engineer Whiting known anything of the hydrography of the outer bar (at Wilmington) he would have placed Fort Fisher a mile inside where he did, where it would have been unassailable by ships, and have equally commanded the approaches." Captain Bridge, in his paper previously referred to, mentions, from his own knowledge, a case of a fort in the White Sea built specially against ships, which was attacked by one of ours from a position where scarcely a gun could be trained against her.

At this present moment the defences of some of our important Colonial seaports have been settled by two eminent Officers of the Royal Engineers.

It is certain that if attacked, the Officers of that corps will not have to defend them, while it is more than probable the Navy may. I may be mistaken, but I do not hear of any naval authority having been consulted as to their position; none were on the Commission.

8th. Captain Bridge has pointed out, as I also gather from these facts, that at the outbreak of a war, the maritime defences will probably be in a backward condition, and that therefore the sooner an attack is made on them the better prospect is there of their being reduced, "and that an enterprising enemy has the chance of unpreparedness on the part of the defence, if on his side he lose no time." On this point we may take a lesson from the Russians, who are preparing privateers to prey on our commerce, and they may succeed at first, but their career will soon be over; our defence will become too strong.

And now to conclude. When we remember that in 1814, with a population of 18,000,000, we had 147,000 seamen and marines, 114 line-of-battle ships, with a proportionate number of smaller vessels in commission; and that the Americans in three and a half years increased their Navy from 42 ships to 700, and from 7,000 to 51,000 seamen, I do not think the resources of the country would be over-strained with our present population of over 32,000,000 if we trebled our present force of 60,000 seamen and marines, as rapidly as ships could be built for them, should war unfortunately be forced upon us: and I am sure, notwithstanding the honourable member for Hawick's speech to his constituents some months ago, not one of my naval hearers, nor military either, if any be present, but would prefer peace for the country to any chance of personal aggrandisement.

Captain COLOMB, R.N.: I suspect that one reason why members are slow in rising to discuss this paper is the enormous mass of facts it has brought before us, and the difficulty of digesting them sufficiently to form any distinct conclusions as to the lessons we should draw from it. I shall merely advert to one or two of the points which occurred to me in the reading of the paper, premising that a discussion on a paper of this kind is one which I should like to see adjourned in

order that we might think it over, and then be in a better position to discuss it. That it is of great importance I am quite certain we are all agreed. We have here not the theories of book-worms, but the actual work of men who were fighting for the great prize of victory, who did on both sides the best they could, and who performed, so to speak, experiments from whose results we in this country, if we are wise, shall draw the necessary conclusions, and follow out the steps to which these conclusions lead us. Information as to the results of the American War, so far as I am aware, is only to be gathered here and there. I had not heard of the work which has been especially adverted to by the lecturer, but I have always observed one gets a fact from one book and another from another, but we do not get such facts as we want in a concise form so that we can deal with them. We have now got them for the first time, as far as I know, in the paper which has been read. Our attention is drawn, in the first instance, to a very important lesson. The Northern success, the lecturer has shown us, was in the first instance due to their actual possession of the naval field. They actually had the Navy in their possession, and there was very little secession from the Navy of the North to the Southern side, so that the North began with a strong navy in comparison with that of the South. Now we have to recollect that so far that is our position here in England—we begin in any war with that strong navy which the Federals possessed. The next lesson which struck me was the enormous speed of production which can be got up when pressure is brought to bear. At the present time there is no more common point of discussion amongst naval Officers than the assumption that the days of large fleets and large assemblies of fleets are passed. Since my return to England, if I have heard it said once by competent naval Officers I have heard it said a hundred times, that the days of gatherings of large numbers of ships together are passed. I hold exactly the opposite view. Because ironclads are expensive, because they take some time to build when we are only building in dockyards, and because there are few rolling mills, and so on, we say that it is impossible that large fleets can be brought together. I think the lesson to be drawn from the early part of the paper is, that that is all nonsense, that if you go to war, and it is necessary, you will have in a very short time most enormous fleets; much larger than we had in the Crimean War or in the wars of the French Revolution. I look upon that as a perfectly distinct fact which we should never lose sight of. I was not aware until I heard this paper read of the relatively greater force of ships as regards land forts. I had held, putting aside the question of ironclads, that it was even established in America by the American War, that as a general rule the ship was inefficient as against the fort. While I had, on the other hand, always understood it was an axiom that a fleet could always run the gauntlet of any number of forts, I thought that that was the point established by the American War, but I did not quite see that the forts could be actually reduced and their fire suppressed, although, as the lecturer pointed out, they could not be taken possession of except by an army. I think that is a most important point to dwell upon; I have held myself that now in the days of ironclads most existing forts are destructible by a sufficient force of ships, and a great many of those forts that we could not satisfactorily destroy in the old days of wooden ships, might be quite satisfactorily destroyed by the modern ironclads. The best method of attacking forts was clearly set out in the attack on Fort Beauregard; the ships formed in line ahead, and passed at different distances backwards and forwards successively, and in close order, the effect being that any single fort receives broadside after broadside with intervals of only a few seconds, while their reply of course depends upon the time it takes to prepare and relay their guns, so that a fleet gets that advantage—in point of fact the fleets “double on” the forts. I was very much struck by Admiral Farragut’s opinion of the effect of offensive fire as a defence, and it is a point which I have often thought over myself. After all that has been said and done, it may be better to have an effective attack, and to trust to that effective attack for your defence. Is it not better that you should lay primary stress on the attack and less stress upon the simple defence, because if your attack is sufficient, your enemies will not stand to their guns, and therefore you will have that defence? I very strongly agree with the remark of the lecturer that all study, science, and theoretical arrangements for manœuvring fleets are as a mere nothing compared to the practical working of them. No man can know what can



be done with fleets till he has actually got into the ships themselves, and has seen them moving, and has known within what limits they can move. I do not mean to say it is not well for him before he undertakes that office to have some knowledge of the theory of the question. There is one thing which we possess in the Navy, and lay great stress upon, it is a point which bears very much upon the successes of the Federal Navy against forts, that is our rapidity of fire. I was once very much struck by the remark of a military Officer present on board one of our ships in the attack on some of the forts in Japan. He was talking over the matter with me, and he simply ridiculed our rapidity of fire. There was nothing I could say that would persuade him to the contrary. He was assured that we were wrong; the thing was, in his opinion, to have a slow, deliberate, and quiet fire. We, on the contrary, say, "Get accuracy, but always combine it with rapidity;" and the rules for our prize firing in the Navy are perfect on that head, we say to the competitors, "Get your accuracy, but if you take too much time over your accuracy the prize will be withheld from you." Rapidity is nearly as important as accuracy, because it is not altogether the question of hitting, it is the question of demoralization; and if you burst shells over ships or forts, you demoralize the crews of the guns; they make bad shots; they become unhinged; they do not quite understand the orders they receive, and by the establishment of what school-boys call a "funk" you actually win the battle. Your battles are not gained by the destruction of human life, they are gained by nerve-disturbance. If you can destroy your enemies' nervous force, you gain your victory, not by killing and destroying him. Soldiers and sailors will, of course, always dispute as to the value of the fort against the ship, and the ship against the fort, each side will say that there is nothing like his own particular leather, but I do agree most strongly with the lecturer in saying no sea-batteries should ever be placed by any persons employed by the English Government unless naval Officers are in communication with them, and have an equal voice in the placing of those forts.

Admiral Sir LEOPOLD M'CLINTOCK: With your permission I should like to ask the lecturer whether he can give us any further information with respect to torpedoes; he only mentioned them as being successfully used on one occasion; and also as to the amount of damage received by the earthworks. It appears that the gunners were driven out of the earthworks, but it does not appear that the earthworks were destroyed or scarcely damaged by the fire from the ships.

Lieutenant-Colonel E. W. CHILDERS, R.A.: Perhaps you will allow a soldier to speak for one moment on this subject. All I want to do is to confirm what the lecturer and Captain Colomb have said as to the great necessity for the assistance of a naval Officer in order to prepare forts for the defence of sea coasts. On one occasion I was directed by a foreign Colonial Government to form one of a committee for the defence of a very large town. In the first instance, we got large instructions as to the fortifications we were to draw up. The plan of fortification was so large that we asked whether we were to have unlimited funds? They told us to defend the place in such an elaborate manner that we thought fortifications would not be required at all, that with the men they had got at their disposal, or might have at their disposal, they might defend the town by an Army at a very much cheaper rate than by the fortifications we should have had to prepare for them. The answer we got to that evidently showed that they really did not know what they did want; but they said we might drop the land fortifications, and might draw up a plan of sea-fortifications which would render the place impregnable against any armour-clad fleet. You will admit that that was rather a large order, but at our first start-off we found that, having no naval Officers on our committee, we were not fully aware what the strength of an armour-clad fleet would be when brought against that town. We drew up a plan of fortifications as moderate in price as we could possibly make it, and, in sending it in, explained that it was possible we might have made it a great deal too strong for the necessities of the case, and that we might also have made it too weak; but without the experience of a naval Officer we could not decide that point. I therefore would wish to confirm what has been said by the lecturer and by Captain Colomb. I may also add that in that particular station where we were, I suppose it would have been extremely difficult to have procured a very experienced naval Officer to have helped us; but it would have been well worth the

trouble and expense of getting one from some distance. I should like to say one word with regard to forts and ships. I suppose there are certain circumstances under which ships could not be used for the defence of places; you must defend by forts, but after a very long experience in this matter, and having been engaged on committees for the defence of two seaports, I think it is possible that ironclad floating defences might be made a very prominent portion of the defence of every seaport. With regard to the wonderful revelation we have heard to-day, which I must also say is a revelation to me of the extraordinary way in which the Americans on both sides disarmed land forts by the fire of ships, and as it appears really under a superior fire in many cases—for we find that inferior ship's fire silenced superior land fire—I cannot help thinking it is greatly due to this fact, that their Admirals and Captains were not in any way afraid of consequences. I cannot help feeling that an English Officer at sea, very like an English Officer on land, fights very often with one hand tied, and that the real secret of these wonderful successes was that Admiral Farragut, having made his preparations, was not at all afraid to lose a certain number of ships in order to carry out his plans.

Captain VERNEY, R.N.: For my own part I think the profession owes a great debt of gratitude to Admiral Hamilton for the way in which he has condensed so ably these accounts of the American actions, and it would be very much to the advantage of the profession if he could be induced to enlarge it in the shape of a pamphlet, giving still further details instead of being obliged to condense it into the short space necessary for a paper to be read before this Institution. There is one thing with reference to the manœuvring of ships against land forts which has not been brought out, and which I think of the utmost importance: that is that naval Officers should have every opportunity of knowing the powers of their own ships. The question is sometimes asked me why there are ever accidents in the Navy when you have highly trained and experienced men devoting their lives to the Service, why there should ever be mishaps? It is pointed out to me that with merchant ships some companies never have any accidents whatever, and why should there be any in the Navy? There is one way in which we are under a great disadvantage in the Navy. Merchant Captains are accustomed always to handle their ships at full speed, but in the Navy we very seldom have the opportunity of handling our ships at full speed. If ships are to be engaged with land forts it must often be while they are at full speed, and above all the Captain must be able to judge the space in which his ship will turn. If they are to turn round and come back again, and there is shallow water on each side, the Captain should have the most absolute certainty so as to be able to tell by his eye exactly the circle his ship will describe at full or half speed, or with half or all the helm. He must know that with absolute certainty. My own opinion is that we do not get a fair chance in the Navy of exercising our ships at full speed in turning and manœuvring. We sometimes have fleet evolutions, but they are so very expensive that they are not sufficiently encouraged, and certainly in that matter I do not think enough is done to enable Captains to handle their ships in narrow waters. This question of handling ships against forts is one of the utmost importance, and I do not think we in the Navy have sufficient opportunities given us to know how to handle our ships.

Captain COLOMB: I should like to correct an impression which might be caused by the remarks of my friend Captain Verney. I think I am not mistaken when I say it is laid down in the instructions, which every Captain possesses, that he is to make himself acquainted with all those matters of which Captain Verney has spoken. He is told distinctly to ascertain those facts for himself, and if he does not do it the responsibility lies upon him. He is told also to use blank cartridge for ascertaining the effect of smoke, and, in point of fact, to make all necessary experiments. I am quite aware that we do not always make them, and I do not think we are altogether to blame for it; but we do not do it because we are not so alive to the importance of it as Captain Verney rightly is.

Mr. SCOTT RUSSELL: I quite agree with the previous speakers that this is so valuable a paper that it is scarcely possible, with due regard to its merit and value, to discuss it adequately. There are, however, one or two points which Admiral Hamilton has been good enough to put to me, to which I must reply. He seems to think, and he thinks admirably, that the resources of this country for creating,

under circumstances of great difficulty, a large and efficient fleet, are greater than the resources of any other country for the same purpose. I frankly admit that, but let me add, that the needs of this country for a very enormous fleet are also far greater than those of any other country, and the question is, not as it is very often put, whether we are as ready as other nations are, and as well prepared, and as thoroughly armed as other nations are. That is not the point at all. The point is, are we as ready and well prepared in proportion to our needs and in proportion to our duties, which are far beyond those of any other nation? It has rather been a rule in discussions here, not to criticise our fleet as it is, but with regard to our preparations for the future. Let me mention, that during the Crimean War I had a great deal to do with the preparation for the future, and I am sorry to be obliged to tell you, that in the Crimean War, in our naval affairs, we were quite ready when the war ended, and it was then too late. Now, I am afraid, that if you rely too much on the resources of the country, you will be quite ready when it is too late. At the same time, permit me to say that you have seen in the newspapers, and I believe it is quite correct, that Russia, early in this year, determined to have 100 very fast torpedo vessels. I think I have reason to know that that hundred will be quite ready about the 10th June, and, therefore, after the 10th June, something may happen. If Russia, without English assistance—with considerable assistance, but without English assistance—has been able in, I think, about four months, to get a fleet of 100 torpedo vessels ready for efficient action against somebody, perhaps or perhaps not, I think it is a rule-of-three question, which you will easily settle, how many torpedo vessels could all England create in three or four months? I think the figure would be a very large one. Therefore, in that figure I would entirely confirm the statement of Admiral Hamilton, that we have amazing resources. But I fall back upon an admirable phrase which he used very early in his paper, the phrase in which he attributes much of the success of the Federal fleet to the fact of the Government of that country “having long before made up its mind as to “what it wanted,” and to the Admirals and Officers of that fleet having very thoroughly “made up their minds beforehand as to what they intended to do.” Now, I believe that that condition, that the Government of a country should have in its head a clear plan of a fleet long before it is wanted, is most important; and, secondly, I would advocate strongly what Captain Verney proposes, that the manœuvring and handling of a fleet should, at any cost of time, trouble, and money, be brought to a far higher degree of perfection than it now is, for I am satisfied, from experience, that we have many ships that will not obey the will of the Captain, however strong-willed he may be, and it is those ships that will disobey the will of the Captain that will be the great difficulty and danger for England. On another point I am extremely glad Admiral Hamilton has brought out this conclusion, which I have often, as a pure piece of theory, proposed in this room, but I do not know if it has yet been efficiently carried out—I mean for the Navy—the enormous benefit of large shell guns as distinguished from mere shot guns. My opinion is, that in the modern Navy, mere solid lumps of shot, whatever they are made of, whatever their penetrating power, do contemptibly little harm, and I believe the great instrument for the Navy will be, what we have so often discussed here, a shell gun of larger bore than at present. Then another point comes out, which is of great value, that our ships, if possessed of quick manœuvring (and that is a great point), and if thoroughly trained to quick manœuvring, will have such a power of fighting the large, powerful guns of land batteries, that I attribute much of their safety to that point. I believe, that although the land batteries possess a great power of aiming, yet the fact of the varied motion of fleets is the best means of opposing the land shot. The other point to which I would call attention is this. I think that these American vessels, being able to fire three of their guns end-on—for that is quoted as one of their qualities—is a very important quality, for you must remember, that in attacking a land battery, coming end-on is probably the very first part of the manœuvring. You remain end-on for a long time, and, therefore, you may almost say that the end-on fire of a ship is a great measure of that ship's efficiency. Manœuvring power, large-bore shell guns, great experience in manœuvring, as many guns end-on as possible; I think these are the great points in a fleet. And the next great point in a fleet, I should say, would be having at least four entirely



distinct fleets composing one fleet. By that I mean that there are at least four entirely different classes of vessels, which four classes together form an efficient fleet; and if I were asked, what is the greatest want for the future in the Navy, I would say, the greatest want of the future,—and the sooner it is supplied the better,—is those four classes of vessels, with their different degrees of armament, different speeds, and different draughts of water, all ready to be incorporated together into a single fleet. I am afraid we have not completed that yet, and I am afraid, until that is completed, the ideal of a naval engagement will not be carried out.

Rear-Admiral JASPER SELWYN: I find a little difficulty in discussing this paper since Admiral Hamilton has really put before us a large number of very carefully collated, highly elaborated facts, and we are not called upon to discuss those facts, so much as the lessons generally to be derived from them. The first title of the paper, as I understood, was "Lessons to be derived," and there is certainly a great deal to be derived, as Admiral Hamilton said, but we must not fail to recollect that we have several disturbing elements in our decision. The first is, that on one side during that war there were a large number of trained gunners, and on the other side very few. The second is, that these operations were conducted with known currents: they were conducted in smooth water, and in places where ships could not be seen at a great distance, and in order to show you what effect that may have, I will tell you what took place the other day in the East. Admiral Hobart Pasha took the Turkish ironclads across to have a look at Sebastopol. When he got within 6,000 yards, he saw the heliographs flashing from fort to fort. Just as he had shifted his helm and changed his ships' course, there plunged into the water simultaneously from those forts, most of them having 38-ton guns, a mass of iron, which, had it come on board, would have sunk his ship. The modern plan of plotting out harbours and their vicinity into squares, and the use of electricity for the firing of guns, has given us very different conditions from those which formerly obtained. That plan I first saw—I believe it was immediately on its inception—in the hands of Lieut.-Colonel Moncrieff, who has done more to solve the two questions of attack and defence on the coast than any other man I know. He has also shown how to do what was not done in those cases, he has given us a power to place the heaviest guns in separate pits, and yet, with all-round fire, utterly invisible to an attacking fleet. We have tried lately some experiments at Eastbourne, where we endeavoured, for a whole day, to land a shell in one of those pits and did not succeed. Unfortunately facts and discoveries come so fast now-a-days, that facts as old as those of the American War must be viewed under these different lights of science, or a due value is not given to the facts on one side or the other. There is also a fact with regard to the guns and their employment at the present day, which we did not then obtain. We have, wisely or unwisely, resorted to slow-burning powder, and in doing so, where we formerly produced nearly all carbonic acid, as the result of complete combustion of powder, we now produce an enormous quantity of carbonic oxide, which makes a yellow smoke almost impenetrable to sight, which, although it may shield the shipping from fire, yet prevents their correct aim, and, I think, that is a disadvantage in most directions, since the masts of the ships will afford a better mark to the gunners on shore than the forts will to the gunners on board the ships. A large number of these defences were not such defences as are now known to be the most effective for rifled guns. Very highly-placed guns on bluffs are, of course, most annoying to ironclads which have to pass them, since their armour offers little protection against a plunging fire. I entirely agree with the gentleman who spoke on the defence of ports. There is no doubt whatever that movable forts, in the shape of ships specially built and calculated for that purpose, something like Mr. Elder's vessels, would be the most formidable batteries that could be opposed to ships. They would be very largely invulnerable, very easily movable in light draught of water, and carrying very heavy guns they would be a very much better thing for the modern defence against the modern offence, than any casemated fort. I do not doubt that casemates will continue to be used until the first 38- or 80-ton guns are fired against them. Then we shall discover how unwise we have been to rely on the size of guns existing at the time for the measure of a defence, which may be utterly inoperative against the next year's gun. Sir Edward Belcher, many years ago, in speaking of the defence of one of our own

Channel Islands, said that he was asked to go and look at the defences after the engineers had erected them, and he being an hydrographer, immediately ran the little steamer in which they went across, within 500 yards of the fort, in a place where not a single gun could look at her. That shows the value of a naval Officer's appreciation of the way he means to attack being communicated to the engineer Officers before they plan their forts. With regard to Captain Verney's observation, as to the manœuvring of our ships, I have also regretted with him, that the expenditure of coals is so distasteful both to the Admiralty and to the Officers who command ships, and who wish always to keep them in a state of perfect efficiency, that we do have much less manœuvring than we used to have, and it is desirable that it should be increased. I think this year will show the world that whatever coals we carry can be doubled in effect by very simple means. The boilers which have been spoken of here by Mr. Perkins, are now in full process of application to ships, and there will be, in the course of a month or two, a steamer of 800 horse-power running down the Thames with that boiler on board. I may say, for the information of the meeting, they will burn rather less than 1 lb. of fuel per indicated horse-power per hour. Thirteen years' experience of one stationary land engine has shown an expenditure of  $\frac{3}{4}$  lb. of fuel per hour. With regard to an observation with which the lecturer concluded his paper, it has been said, and I am afraid it has been credited by some persons, that naval Officers are anxious for war. It has been stated by an authority who ought to have been ashamed of such a thought. I have no doubt whatever, what the lecturer has said will be felt most deeply by the whole profession. We know too much about the horrors of war ever to desire it. We do our duty when the nation calls upon us to do it, but it is with regret and with a full knowledge of the dreadful effects of what we are called upon to do. No man, who calls himself an Englishman, ought to get up at a public meeting and make any such assertion.

Commander CURTIS : I only want to mention one thing, and that is, that so lately as the Crimean War, the Wasp<sup>1</sup> battery drove off the "Albion," and, I believe, the "Terrible." It contained eight guns in a pit. The ships were 1,400 yards off, and while the battery was not touched they were obliged to retire. "Albion," "London," "Terrible," "Sampson," and "Arethusa." The attack on the Telegraph and Cliff batteries was a total failure, they beat the above ships off with several casualties.

General ORFEUR CAVENAGH : I think the lecturer has clearly shown that a squadron with preponderating and rapid fire need not fear, under present circumstances, to attack isolated batteries and forts, but he has said very little in elucidation of a subject that has also engaged attention here, namely, the question of isolated forts *versus* isolated ships. In most of our colonies, the forts erected are intended to protect the harbour and mercantile shipping from hostile vessels, which may have escaped our own cruisers, because we, as Englishmen, generally believe when once there is war, no large squadrons will hold the seas, as our own Navy will settle with them. But there may be cases where isolated vessels may escape our ships and attack our colonies, and it is, consequently, simply for the protection of the harbours and of the shipping against such attacks that the forts have generally been planned. Still, at the same time, any soldier who has visited any of those colonies, will most

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NOTE.—<sup>1</sup> The Wasp Tower was 130 feet above the sea, and much as it made itself felt, the allies, at the beginning of the war, hardly knew the form of its structure: it was a square tower, 27 feet high, with a diameter of 50 feet, and surrounded by a ditch, mounting 8 guns, 5 of which ONLY could be brought to bear upon the shipping beneath. The Russians say they could only work one gun efficiently, and with that one the mischief was done. "Albion," 600 yards from the Wasp, aided by "Sampson," "Tribune," and "Terrible." "Arethusa" near sank by Cliff batteries. "Albion" set on fire and had to haul out; also "London" in hauling out "Firebrand," had towing lashings shot away. "Albion" had 10 killed and 71 wounded. Altogether the attack of the inshore squadron on the Telegraph, Cliff, and Wasp batteries was a total failure, showing how cautious Officers commanding wooden vessels should be in attacking earthworks, without allies ashore.—Page 404, Vol. iii, "Kingleake's Invasion of the Crimea."

fully agree with Colonel Childers that all our forts ought to be supplemented by a floating battery—an ironclad—which would always be able to take up such a position that no part of the harbour could escape fire, because even the most elaborate scheme of land batteries may allow a certain portion of dead ground. This would be obviated by supplementing the fire of our land defences by that of a vessel of the description pointed out. Therefore, I perfectly agree with much that has been said as to the propriety of seeking the advice of our naval colleagues when planning the construction of works for the purpose of defending colonial harbours.

Captain McEVoy: I very much regret to say that I was unable to be present when the paper was read, which I have no doubt was extremely interesting. I regret it very much, because I myself saw many of the operations connected with the American War. I was attached to the Bureau of Ordnance and Hydrography, under its chief, Captain John M. Brooke, and was stationed at Richmond during the last two years and a half of the war, where I had the personal superintendence of nearly all the experiments made with the projectiles and ammunition for the Navy, manufactured at the Naval Ordnance Works at that place. Had I been present when the paper was read, I might have been able to supplement it by some explanations which, perhaps, would have added to the interest of those present.

Admiral HAMILTON, in reply, said: I do not think I have much to answer. Captain Colomb, being an old friend, has let me off very easily. In reply to Sir Leopold M'Clintock, I do not think we gain much information of any value with regard to torpedoes from the American War, for the simple reason that the Southerners had very few mechanical resources. Their torpedoes, on the whole, were rather a failure. I can only trace that five vessels were blown up by them. The Northerners scarcely used them, but torpedoes have so completely altered their character since then that I do not think we can gain any knowledge from the information derived from those operations. With regard to the earthworks, that is one of the things on which I am rather puzzled to know what history is, for, since I wrote my paper, I have come across "Pollard's History of the First Year of the War." (A Confederate account.) Admiral Porter says, in his report, that he destroyed Forts Jackson and Philip, whereas Pollard gives a telegram from General Duncan, who commanded the forts, in which he, on the 23rd April, spoke most favourably as to the condition of the forts. Although the bombardment had continued a week, and 25,000 shells were thrown by the enemy, only three guns were dismantled, five men killed, and ten wounded. The same night the forts were passed. Admiral Porter also reports, on Grand Gulf, that the earthworks were knocked to pieces, and the muzzles of the guns choked up by sand thrown into them by the shells, and that, as a rule, the water earthworks were destroyed, while the higher ones were not much damaged. The great conclusion, however, that all the accounts come to is that, though the ships could always silence the forts, they could not destroy them; that, the moment the ships passed them, the forts very often opened fire again. Mr. Scott Russell speaks as to the value of very large shells, and I must say I was not, until I had read the books, aware of the value of shells. The great reason of the success of American gunboats up the rivers against the batteries was, that these little bits of vessels were armed with nine and eleven inch guns, and, although the battery could bring three or four guns to bear against them, it could do nothing to check the damage done by the bursting of the eleven-inch shells. There can be no doubt that the Federals showed great skill in the use of their shells. Admiral Selwyn spoke of the want of trained gunners on the Federal side. I think, however, that remark attaches to both sides. Of course, the sudden increase of men from 7,000 to 50,000 necessitated that a great part should be untrained men, and, of course, we can train our men to work the guns much more quickly on board the ships than can be done on shore, because they have no military duties to perform. Therefore, we have a great advantage in that respect. Most of the actions certainly were fought in smooth water. There was, however, one case in which a fort was bombarded from the sea, and I should imagine there was a swell on, because the "Cumberland" was towed out to sea at night, on account of threatening weather. All the other actions were fought in perfectly smooth water. At Mobile, it is specially said by the Confederate report that the men were well trained artillerymen. They had been in those forts two or three years, and were, no doubt, thoroughly up to their work.



However, the smoke obscured the fleet. That obscurity caused by smoke will, I think, to a great extent stop the effect of the electric torpedo. Of course, the torpedo is to be respected, but I do not think it is as formidable as artillery fire, and I believe means will be found of neutralizing the great damage likely to occur from the use of such weapons. Admiral Selwyn said they could not lodge a shell in the Moncrieff gun-pit. No doubt that is the case, but what would be the effect on the men working that gun if shell after shell were bursting in front of them. We have heard that the men on the "Tennessee," where the shell did not penetrate, and where the port shutters were down, were blinded by the blaze of bursting shells. What would be the effect on men in a pit, of shells bursting over them? I am perfectly sure that it would be very demoralizing, and the service rendered by the guns they were working would not be of much value. The Wasp Battery was at an elevation of 700 or 800 feet, and the ships could not elevate their shot to reach it. The ships were firing shot instead of shell, and the enemy had got the range. The ships were not kept in perpetual motion, but were stationary, at 1,400 yards. I quite agree with what has been said by General Cavanagh as to the advisability of a naval Officer being consulted with reference to the erection of forts to protect harbours. If engineers only are concerned they may build forts which will not be an adequate protection, whereas, if a naval Officer is consulted, the probability will be that there will be no dead spot left which cannot be reached by the guns. I do not think that I have anything further to say, except to thank you for the attention with which you have listened to me.

The CHAIRMAN: There only remains for me the agreeable duty, which I am quite sure the meeting will support me in, of thanking Admiral Hamilton for his very interesting lecture, and also those gentlemen who have taken part in the discussion. It is a very large subject, and one that certainly cannot be fully dealt with in one sitting of this description.

## LECTURE.

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Friday, May 17th, 1878.

ADMIRAL A. P. RYDER in the Chair.

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### ON A COLONIAL NAVAL VOLUNTEER FORCE.

By THOMAS BRASSEY, Esq., M.P., Lieutenant Commanding Royal Naval Artillery Volunteers.

It is not suprising that the idea of organizing a Colonial Naval Reserve should have been deferred to the present time. The growth of our Colonial Empire has been so rapid that the resources out of which such a force could be created have only lately been at our disposal.

It has been remarked by Mr. Wilson, in his recent volume on the resources of modern countries, that none of the colonies were of great promise before 1845. Canada languished; New South Wales—then including Victoria and Queensland—was a feeble settlement, still troubled by a residuum of transported criminals; the Cape of Good Hope was almost Dutch. The total English population of the whole of our foreign possessions did not, in 1850, exceed 2,000,000. The population of these colonies has at least quadrupled in thirty years, and in some cases is now tenfold what it was in 1845.

Visitors to the Exhibition now being held in Paris will see abundant and gratifying proofs of the marvellous development of our colonies, and of their ability to provide adequate means of self-defence. The Australian governments have wisely embraced the opportunity of showing to the world their varied and valuable products. From New South Wales we have copper, silver, lead, marble, tin, slate, and opals; wine—including all the varieties of the French and German vineyards—tobacco, and, perhaps most important of all, wool. From Western Australia we find leather, timber, silk, coal, lead, and wines. Victoria, which boasts of 800 trees and flowering shrubs, exhibits also coal, wines, and cloth manufactures. She reminds us, by means of pyramidal models, of the value of her productions of gold, and of the exceptional good fortune of certain adventurers. From the Cross Reef Mine £1,000,000 worth, from the Long Tunnel 221,262 ounces, from the Port Philip Company's workings to the value of £1,500,000 have been extracted.

Queensland exhibits malachite, gold, copper, cinnabar, chrome, iron, plumbago, and antimony, sugar, coffee, wheat, maize, tobacco, silk, and wool. The commercial and agricultural development of the colony is set forth in the following figures:—

In 1876 the total value of the exports amounted to £3,875,000, including—

Wool .. ..	£1,449,576
Hides .. ..	79,612
Cattle .. ..	157,772
Preserved meat ..	94,642

The value of the imports in the same year was £3,126,000.

Queensland has a population of 200,000.

The live stock depastured includes—

Horses .. ..	130,289
Cattle .. ..	1,985,807
Sheep .. ..	7,241,810
Pigs .. ..	53,455

Lastly, South Australia exhibits copper, tin, wines, timber, leather, wool, and tobacco. With such a collection before us, we are justified in forming the brightest hopes for the future prosperity of the great Anglo-Saxon communities in the Antipodes. The page of their history is short, but they are a vigorous and energetic people, eager to embrace every opportunity afforded by a bountiful nature, and labouring valiantly in the spirit of their well-chosen motto, "Advance Australia."

The time seems now to have arrived when the colonies should be reminded of their obligations to provide for their own self-defence, and of their duty to take a part in those naval and military preparations, the cost of which should be borne in due proportions by the whole Empire.

The necessity for the organization of a Naval Reserve for the defence of the colonies has been recognised by many lecturers, who have preceded me in the theatre of the Royal United Service Institution. The brothers Colomb have been among the foremost in urging the need of such a force. They have shown what are the strategical points which are of the most vital importance to the integrity of the British Empire, and have earnestly recommended the appointment of a Royal Commission to examine the subject. Nothing, however, has been done, and we find ourselves at the present moment contemplating the possibility of war, and utterly unprepared with the means of defending the important outlying members of the Empire by those local forces, which might so easily have been organized. Readers of the papers published in the "Nineteenth Century" will remember the imaginary but very forcible description recently given by Sir Garnet Wolseley of a Russian squadron performing a cruise of circumnavigation in time of war, arriving off all our most valuable settlements, and winning a series of inglorious triumphs by levying black-mail on rich seaports, which could offer no resistance. It would per-



haps be found more difficult to carry out such a series of operations, than to describe them with the ready pen, which Sir Garnet so well knows how to use; but the bare conception of such a state of things ought to be unendurable, alike to the people of the mother-country and of her dependencies.

The policy of encouraging such a movement having been accepted, there can be no practical difficulty in raising a Naval Reserve in the colonies. If it be intended to provide the means of manning sea-going ships, the Naval Reserve which has been formed for the defence of the mother-country presents a model for imitation. If coast and harbour defence alone is attempted, the system of organization adopted for the Royal Naval Artillery Volunteers may be followed with advantage.

In considering a project for a Colonial Naval Reserve, it is essential to determine, *in limine*, to what extent the direct intervention of the Imperial Government will be required. Among a certain school of politicians, it will be considered that local defence is a task which must be left entirely to the Colonial Governments. They think that the colonies are quite able to take care of themselves; that, man for man, the colonists are better off than the population of the mother-country; that it is the duty of our statesmen to rear up young and vigorous communities in habits of self-defence, and to bring home to their people a sense of their obligation to make sacrifices for public objects, and to bear their proportionate share with the mother-country of the burdens of military preparations.

Another school of politicians is in favour of a closer connection with the colonies. They are anxious to promote a federal union of all the members of the British Empire. They wish to arrive at a mutual agreement on all questions of tariffs; and, with a view to concerted action in Imperial questions, they are in favour of giving to the colonies representatives who should sit in the great council of the Empire at its seat of Government. In consideration of the protection afforded by the fleet, they are prepared to recommend a contribution from the colonies to the naval expenditure of the country. In these views I concur, and I see additional evidences of their truth in the most recent incidents in our political experience. It is rarely possible for this country, under a popular representative Government, to pursue a satisfactory course in its relations with foreign countries. The greater number of those who take a lively interest in public business concern themselves rather with domestic questions than with foreign policy. Being without knowledge, they arrive at hasty conclusions, and every new incident that occurs produces a corresponding change in their opinions. Hence it is that our foreign policy is inconsistent and uncertain; that we disappoint allies in whom we have raised expectations; and make sacrifices for unattainable or unworthy objects.

The Eastern Question once disposed of, it is my earnest hope that the attention of British statesmen may be directed rather to the object of drawing the colonies and the mother-country more closely together, than to continental affairs.

In our relations with other nationalities we excite jealousy by

our prosperity. Although singularly unselfish and unaggressive, our country is not greatly loved abroad. On the other hand, old England, as their mother-country, still retains the warm affection of her colonies. Our Government may show a chilly indifference to their concerns, but England is still the "home" of all English-speaking people; and the identity of religion, history, laws, and literature, unites together every member of the family by bonds more enduring than the protocols and treaties, however valuable they may be, which are negotiated with foreign nations.

The arguments in favour of a cordial co-operation of the United Kingdom with the colonies in measures of mutual self-defence have been conclusively stated by several able writers in recent periodicals. I may specially refer to Captain Colomb, Sir Julius Vogel, and the author of a paper on England and her Colonies, which appeared in "Fraser's Magazine," in January. We are reminded, in the papers to which I refer, of the value of the colonies to the mother-country, for the inevitable development of the British population, and as the main source of our maritime prosperity. While foreign countries are steadily determined to exclude British industries from the markets over which they exercise control, the value of the colonial trade becomes increasingly manifest: and, while we derive these advantages from our vast colonial connection, it is obvious that, in proportion to their own prosperity, the colonies are bound to take their share in defending the Empire. It is to be regretted that these obligations were not more strictly defined at the time when the privilege of self-government was conceded.

In his speech at the Crystal Palace, in 1872, Lord Beaconsfield said:—"Self-government, when it was conceded, ought, in my opinion, "to have been conceded as part of a great policy of Imperial consolidation. It ought to have been accompanied by a military code, which "should have previously defined the means and responsibilities by "which the colonies should have been defended, and by which, if "necessary, this country should call for aid from the colonies themselves. In my opinion, no minister in this country will do his duty, "who neglects an opportunity of resuscitating as much as possible our "Colonial Empire, and of responding to those distant sympathies "which may become the source of incalculable strength and happiness "to this land."

From an Imperial point of view, the best defence of the colonies consists in a powerful navy; and it is because the naval service is constituted in part for the defence of the colonies that we may reasonably claim from all our dependencies contributions in equitable proportions, to be mutually and amicably determined, towards the naval expenditure of the country.

The latest tables, showing the progress of British mercantile shipping, give the total tonnage of the mercantile navy of the British Empire at 8,133,837 tons, and the tonnage of the United Kingdom only at 6,336,360 tons. The difference between these amounts (1,800,000 tons) represents a total tonnage for the colonies which is little short of the combined tonnage of the French and German

Empires. It must be evident that the owners of such a large tonnage will be quite able to contribute their share of the cost of defending the harbours from which they trade.

It has been suggested by Captain Colomb, R.M.A., that one of the home dockyards—Pembroke, for example—might be closed, and the staff transferred to a dockyard which should be established at Sydney or Melbourne. Captain Colomb urges that, with our remaining dockyards, and the boundless resources of our private trade, we should be abundantly able to provide for the construction of new ships, and for the repairs of the Navy, even in times of the most pressing emergency; while, on the other hand, the growing importance of the Russian navy in the Pacific, the extension of British trade over most of the islands in that vast ocean, and the great distance which separates our Australian territories from the mother-country, make it highly desirable to establish a dockyard in that part of the world. It is to be presumed that some contribution would be obtained from the local governments towards the expenses of such a dockyard, if established in their midst. The facilities which it would afford to the mercantile marine would present an additional inducement to the colonies to make a contribution towards its maintenance.

The colonial governments have already begun to consider the question of local defence, and in one or two instances they have provided low free-board ironclad turret-ships for that purpose. Victoria has lately voted a sum of £350,000, together with an annual outlay of £73,000, to provide ships, artillery, torpedoes, and rifles, for the local defence. New South Wales has voted a like sum for the same object. The colony has formed a Volunteer Naval Brigade of 250 men, the annual expenditure on this little force being £3,916. In the Canadian Dominion, a committee appointed by the Royal Halifax Yacht Club, in a report dated 14th April, 1873, strongly recommend the organization of a Naval Reserve, a Coast Guard to protect property in the event of shipwreck, and a Lifeboat Institution.

It may be assumed that the Colonial Governments would be fully prepared to bear their share of the expenditure required for any complete scheme of Imperial defence by naval means; we may pass on therefore to consider what kind of force would be most useful for colonial service.

It has been already observed that the most effective means of defending the larger ports would consist in ironclads or turret vessels rather than in forts. Captain Colomb, R.N., has urged in his Prize Essay that the main object of our naval organization consists in the maintenance of our communications by sea, and that our coaling-stations abroad are the principal strategical positions which it is essential to guard. He argues that this object will be best attained by the maintenance of an adequate sea-going fleet, charged with two great defensive functions:—(1) that of keeping the enemy in his own ports, (2) that of keeping open the great sea-routes to and from the heart of the Empire. He considers that this duty can only be performed by sea-going vessels, and that the building of powerful ships, which are not fully sea-going, and which are more or less incapable of



maintaining the ocean communications of the Empire can only be justified on the assumption that the chief danger to be apprehended lies in a successful attack on our harbours.

But if, he says, our enemies are to career at will across our lines of communication, while we guard their terminations at headquarters, what will be left us to guard? He puts much faith in the sea-going fleet resting on the naval station as a protective force, and condemns with steady design the idea of the harbour-defence ship. Such vessels are every whit as likely to be withdrawn as the sea-going ship, when they are wanted; and the only result is that you build a bad sea-going ship, when, had you never considered harbour-defence, you would have built a good one.

Captain Colomb throws the local home and colonial harbour-defence entirely on forts, and the stationary and locomotive torpedoes. The supplemental local harbour-defence corps is to consist of volunteer torpedo men, whose functions will be of a nature peculiarly adapted to the superior education and undoubted skill and daring of the men who would be enrolled in such bodies.

This view is confirmed by the recent report of Admiral Phillimore on the conduct and efficiency of the Royal Naval Artillery Volunteers, dated 15th March, 1878.

The opinion of my predecessor on the Royal Naval Artillery Volunteers is given at page 7 of his Confidential Report, on quitting office, dated 18th October, 1876 :—

“That they would be useful in the event of war, in the defence of the estuaries, while in peace they serve as a connecting link between the Volunteer movement and the Royal Navy.”

Both at London and Liverpool the condition of the Brigade is excellent. The Volunteers drill with celerity and precision, and are extremely zealous. They cheerfully conform to discipline, and are desirous of improving themselves in every way when embarked for their annual drill.

In some places they might supply the place of the Coastguard temporarily, if that force should be suddenly embarked.

They might furnish guards at rendezvous and places of embarkation to preserve order. Many of them have become expert artillerists.

I think the movement assists in making the Naval Service better appreciated and understood at certain places, and consequently increases the popularity of the Navy generally, which, if more seamen were required for ships of war, might be of great value in facilitating fresh entries.

In my judgment, Captain Colomb is the advocate of a wise policy. The Imperial and Colonial Governments should combine to create a fleet of sea-going ships, which should be kept in reserve in the harbours on the Australian station. Torpedoes and torpedo-boats should be provided for harbour defence. The Colonial Governments should man the sea-going ships, stationed in their own harbours, with their Naval Reserves, and they should provide the *personnel* necessary for harbour defence by the organization of corps of Naval Artillery Volunteers, after the model of those which have been successfully established in London and Liverpool.

The number of sea-going ships and torpedo-boats, and the forces of Naval Reserves and Naval Artillery Volunteers, which would be necessary to man them, is a subject worthy of mature examination by

a Royal Commission. Such a Commission should include, not only officers of acknowledged capability to deal with technical questions, but representatives, who should be authorised to express the views of the colonists, with reference to the proportions in which they would be prepared to contribute to the expense.

I wish to insist emphatically on the importance of the work which would devolve on such a Commission. We cannot conceal from the world the wealth accumulated in the colonial capitals, all of which lie on the sea-board. Their inhabitants possess all the spirit and resources necessary to repel an attack, but these places are at present defenceless. Floating and stationary defences cannot be designed, a Naval Reserve or Militia cannot be organized, without naval and military advice. The colonies having no body of officers to assist them in such a task, it is for the mother-country to take the initiative in the discharge of the urgent Imperial duty of preparing a scheme for the mutual self-defence of all the dependencies of the Empire.

I am not competent to enter into the details of such a scheme as the Royal Commission which I recommend would be enabled to prepare. A degree of local and professional knowledge, which I cannot pretend to possess, and which, indeed, cannot be combined in any individual, would be required in the preparation of a satisfactory plan. As an example of what might be done, I will, however, venture to refer to some notes which I made on the formation of a Naval Reserve in Canada, after visiting the ports in the Gulf of St. Lawrence in 1872.

It is believed that in the Canadian Dominion there are not less than 87,000 seafaring men. In 1872, about 1,000 decked vessels, and 17,000 open boats, manned by 42,000 men, were employed. On December 31st, 1876, the Canadian Dominion possessed 6,952 vessels, of 1,205,565 tons. During the year 1876, 480 new vessels, of 151,012 tons, were built in the Dominion. The value of the fish exported from Canada in the same year amounted to £1,000,000. The value of the exports of the same class from Newfoundland in 1875 was £1,340,000.

It is stated in the annual report of Governor Hill, for 1872, that about 10,000 men are engaged in the seal fishery of Newfoundland, and that this number includes almost every available able-bodied man on the island. The total male population, it should be added, is 75,000.

The rigorous climate of Canada and Newfoundland, throughout their long winter season, makes it impossible for fishermen to follow their regular vocation. The long interval of enforced idleness during winter would afford an admirable opportunity for regular attendance at drill, without interfering with other lucrative employment. A vigorous effort should be made to enrol these colonial fishermen in the Naval Reserve of the British Empire. They are thoroughly inured to the hardships of the sea by the severe weather, which frequently prevails on their native shore. No subjects of the British Crown are more loyal and devoted. There would be no difficulty in giving to the fishermen of Newfoundland and the maritime provinces of the Canadian Dominion an opportunity of embarking for their annual drill at a port

easily accessible from their own homes. A vessel should be commissioned specially for the purpose of training seamen, who have joined the Naval Reserve from Newfoundland, from the ports in the Gulf of St. Lawrence, and from Quebec, Montreal, and other places on the great river. The vessel should be of the corvette class, having a covered deck, in which the battery of guns would be placed. In such a vessel the drills might be carried on with regularity in the most severe weather. The drill-ship would be stationed during mid-winter at St. John's. The harbour is admirably sheltered and a large population of fishermen is congregated in the town and its vicinity. During a portion of the winter the drill-ship should be moved to other points on the coast where the fishermen are settled in large numbers. Thus the members of the Colonial Naval Reserve would have an opportunity of going through the annual course of drill, without being exposed to the hardship of a long sea-voyage to St. John's in their small fishing boats in mid-winter. Along the coasts of Newfoundland there are numerous admirably sheltered harbours, which are rarely frozen up. An anchorage might be selected for the training-ship both in Placentia Bay and in Trinity Bay, perfectly secure, and easily accessible to the large numbers of British seafaring men dispersed along those distant shores. As the spring approached, and the navigation was opened in the Gulf of St. Lawrence, the ship could proceed from harbour to harbour along the southern shores of the Gulf. At Sydney, Charlottetown, and Gaspe, many seamen could be enrolled for the national reserve. It should be arranged that the drill-ship should visit the harbours mentioned sufficiently early in the season to enable the seamen sailing from those ports to go through their annual drills, before the navigation of the St. Lawrence was fully open. The reserve men might thus have the opportunity of attending on board the training-ship, without suffering the serious inconvenience which would be felt if they were taken from their employment afloat in the season of open navigation. Another similar training-ship should be stationed at Halifax, which should visit the numerous harbours on the coast of Nova Scotia and in the Bay of Fundy, in the winter season, when multitudes of fishermen are compelled to remain on shore in consequence of the inclemency of the weather.

We have not neglected to avail ourselves of the services of our colonial population for the purpose of increasing our military resources. We have enrolled large bodies of men belonging to races distinct from our own. There can be no sufficient reason for neglecting to recruit for the Navy among the vast numbers of loyal Englishmen, who animated by a splendid spirit of enterprise and adventure, have settled on the extensive coasts of our Canadian Dominion.

In a lecture delivered at the Royal Colonial Institute, on the 4th February, 1873, M. Bourpilot, a member of the Canadian Senate, remarked that, "In the men that sail the fishing fleets of Canada, we see the elements of a very powerful marine, which will be found invaluable in times of national danger. It may be estimated that the total strength which the fisheries employ throughout all British North America is composed of some 70,000 men." M. Bourpilot was of



opinion that there was no reason why training ships, supported by the local governments, should not be started in the colonies, if the system were found to work well in the United Kingdom.

The policy recommended seems to be in consonance with the views expressed by Lord Elgin, who, when Governor-General of Canada, argued with so much force on the advantages to England and her colonies of an intimate union between them. "Is the Queen of England," he wrote, "to be the Sovereign of an Empire, growing, expanding, strengthening itself from age to age, striking its roots into fresh earth, and drawing new supplies of vitality from virgin soils? Or is she to be, for all essential purposes of might and power, Monarch of Great Britain and Ireland merely?"

The organization of a Naval Reserve in our North American Colonies is not only to be desired as a means of adding to our naval strength for Imperial purposes, but also for defending the colonies themselves. All our colonies, including India, should have a defensive force of their own. Organization beforehand is essential to success in war. By the bestowal of infinite pains on her military organization, Prussia, which seemed for ever fallen after the battle of Jena, turned the tide of fortune in 1815, and, after the campaigns of 1866 and 1870, has become the greatest power of Central Europe.

It is one of the great recommendations of the scheme which I have advocated on this occasion, that it need not involve the country in a lavish expenditure. It is well to prepare in advance plans of earthworks, to be thrown up when required, and to organize corps of naval volunteers. It does not follow that we should undertake the construction of the extravagant fortresses which surround our arsenals at home, or withdraw a single man from the well-rewarded labour-market of the colonies. To build fleets and forts, and to maintain armies in every dependency of the Crown, would be an exhausting and an unnecessary effort. I remember, and approve, the language held by Sir Robert Peel in 1850, when he said: "I believe that in time of peace we must by our retrenchment consent to incur some risk. I venture to say that if you choose to have all the garrisons of all your colonial possessions in a complete state, and to have all your fortifications secure from attack, no amount of annual expenditure will be sufficient to accomplish your object."

Since the date of Sir Robert Peel's speech, that noble Volunteer movement, one of the most honourable features in the recent history of this country, has been originated. A quarter of a century ago, the voluntary submission to drill and discipline of large masses of men, in numbers far exceeding those enrolled in the regular Army, was not anticipated by British statesmen. By the extension of the Volunteer movement, garrisons can be maintained in the largest fortresses and in the most distant outposts, without adding in any appreciable degree to the charges on the Imperial and Colonial revenues.

The mother-country could readily furnish a staff of officers and instructors for the purpose of training the Colonial Naval Reserves. The number of officers required must depend on the strength of the

force which it is deemed expedient to raise. In whatever numbers they may be wanted, they can be supplied from the ranks of those who have retired from the active list, or who are, for the time being, on half-pay. The presence of a body of naval Officers in our colonies will form a valuable link with the United Kingdom.

They will carry with them the spirit of discipline and devotion to their country, which they have acquired from service in the Navy, and they will help to keep alive its illustrious traditions in those young communities, in which it is so important to create a high tone of morality and conduct. The example of her great men is the most valuable inheritance of a nation, and in the career of many of our sea officers the highest moral excellence has been combined with dauntless bravery and skilful seamanship.

Readers of naval story will be familiar with the fine passages in which Southey concludes his biography of Lord Nelson. He tells us how, on the sunny morning of the 21st October, 1805, as the British fleet was bearing down on the formidable array of ships under Villeneuve, Nelson withdrew to his cabin, and, looking for death with almost as sure an expectation as for victory, piously discharged his devotional duties. You know with what calm courage shortly afterwards he entered into battle, and with what conduct and valour our officers and men followed their illustrious chief to victory. The battle of Trafalgar, though considered by Southey as the most signal success that ever was achieved upon the seas, was dearly bought by the death of Nelson; and yet, as his biographer most truly says, "He cannot be said to have fallen prematurely, whose work was done; nor ought he to be lamented, who died so full of honours, and at the height of human fame. The most triumphant death is that of the martyr; the most awful that of the martyred patriot: the most splendid that of the hero in the hour of victory: and if the chariot and the horses of fire had been vouchsafed for Nelson's translation, he could scarcely have departed in a brighter blaze of glory. He has left us, not indeed his mantle of inspiration, but a name and an example, which are at this moment inspiring thousands of the youth of England, a name which is our pride, and an example which will continue to be our shield and our strength."

That the navy of our own time contains many brave men, prepared to serve their Queen and country in the spirit which animated Lord Nelson, we cannot doubt. You remember how the gallant Burgoyne refused to enter the boat in which the sole survivors of the crew of the "Captain" were saved. Humanity to the savage, and fortitude in death were conspicuously illustrated in the closing hours of Captain Goodenough. But the occasions which brought out the high qualities of Lord Nelson are happily rare. The annals of a nation must be long, in order to furnish many examples equally illustrious. Our share in the honour which belongs to the descendants of such men is a privilege of high value; and it will surely be one of the strongest inducements to the formation of a Colonial Naval Reserve, that a link will thus be created with a navy possessing the splendid traditions which belong to the British service.

Captain CYPRIAN BRIDGE, R.N.: Lest it should be supposed that I have risen too soon, and not waited for other Officers of greater experience, and who have given more attention to this subject than myself, I will, with your permission, just mention in a few words why I take such an interest in this question. In the first place, I take an interest that I believe every naval Officer must take; in the second place, I take an interest that I think every colonist (I myself having been born and lived in a colony for some years) ought to take in it; and, in the next place, I take special interest in it as having taken some part in trying to direct the attention of my brother Officers and the public at large to the great question of raising a volunteer force which might be to the Navy what the great Rifle and Artillery Volunteer force has been to the Army. For these three reasons I have, perhaps, been induced to pay more attention to this subject than many people are inclined to think it deserves. In my opinion, no subject that could be brought before any assembly of Englishmen, whether in the mother country or the colonies, is more worthy of attention than this. As Mr. Brassey has very well told us, in the able and interesting paper which he has just finished, the very life of the Empire depends upon those relations which have been maintained with many of our great colonial dependencies. It has been my good fortune to visit every great group of colonies, with the exception of those in South Africa, beginning at Vancouver's Island and ending in Australia, so that I have a somewhat intimate personal knowledge of the condition of many of them. Of the great colony of Canada I am only acquainted with the maritime provinces; of Canada proper, the only places I have ever visited are Gaspè and Paspebiac; as to Nova Scotia, Newfoundland, and New Brunswick, almost every part of their coasts I know well. To show how feasible it has been thought in the Dominion of Canada, even some years before the Confederation, to establish a naval force of their own, there was in existence at Halifax, certainly as far back as 1865, a naval volunteer force. When I became aware that it was in existence, my stay at Halifax was too short, and my occupations too numerous, to enable me to make many inquiries concerning it. I did see some of the Officers and men in uniform, but I understood it was more upon a land basis than a sea basis. The Officers had military titles, and it was intended that they should be employed in time of war chiefly in defending batteries on shore. This is not, of course, what has been aimed at in the proposals Mr. Brassey has made this afternoon; but still I think it does show that, even at that period, they were willing to take some steps towards forming such a force as has been proposed. With regard to the docking facilities in Australia, there must be many Officers who have served in Australia, much later than I have; but as far back as 1859, the ship to which I belonged, of over 1,400 or 1,500 tons, as we then counted them, was docked at a very large dock at Cockatoo Island, above Sydney, which even at that time was very much larger than was necessary to take in a ship of her size, and had previously taken in an Austrian frigate. The island was entirely given up to workshops and such places as are required in a naval yard; and I should imagine, with a very small expenditure of money, and in a very short time, it would have been made, and probably is now made, a very suitable and useful naval arsenal. I should, therefore, be very sorry to see the proposal carried out which Captain Colomb has made, and Mr. Brassey approved, to close one of our dockyards to open up others, because I do not think it is necessary. There was one point to which Mr. Brassey did not allude, which he mentioned as supplementing his proposal, and that is, he did not draw our attention—it could not have escaped his notice, because he has recently been to those parts himself—but he did not consider it necessary to draw attention to the fact, that in the Indian Empire we have a very large nautical population. I do not mean to put them upon anything like the same footing as the colonists; but that they are good seamen, and fit to go anywhere, has been shown by the manner in which they have altogether taken the place of European seamen on the splendid Peninsular and Oriental steamers, not to mention others. It would be possible to so organize a force of these men, that they might set free a very large number of the seamen belonging to Her Majesty's Service at present engaged in special employment, which, during war, could be performed by men of the description of which I have spoken, and would enable the Europeans who now are employed in them to take part in the more important operations of war. There are also, I believe, con-



siderable naval establishments there ; at Bombay, I understand, the dockyard is a very large one. Mentioning that, reminds me of the unfortunate fact, that the Indian Navy was abolished ; we are now feeling the want of it. In Mr. Brassey's paper, he of course alluded to a subject which, if not obviously, is very intimately connected with one to which he was virtually addressing himself, and that is the defence of our ocean commerce. Of course, this question of raising a volunteer naval force in the colonies is solely with a view to defending our commerce. It seems to me there is a great amount of unnecessary alarm. No country has ever had so great an ocean commerce as we have, and no country has ever been in a position so thoroughly well able to defend it. All the arguments drawn from the case of the "Alabama," or the history of the war between the Northern and Southern States, when the American flag was driven from the ocean by one or two fast cruisers, are absolutely inapplicable to the condition of affairs at present. The American flag flew on sailing ships almost exclusively, and the cruisers which went against those ships, and eventually swept them off the seas, were steamers. A glance at the chart (on the wall) will show that it is marked with numerous lines, which lines, going from port to port, mark out the great highways upon which the ocean commerce of the world chiefly passes. Almost without an exception, every one of the most important of those lines begins and ends at or passes through some British possession. There is one great gap, I admit, in the system of defence supplied by our foreign possessions ; that is the line which, we will say, begins at Vancouver's Island and ends at the south of South America and the Straits of Magellan. It is true that that line is flanked entirely by foreign countries, and we have no stations within those limits, which must be some 6,000 or 7,000 miles apart, where we can post a defensive squadron, or, what is still more important, for a defensive squadron, obtain supplies. But we ought to recollect we hold both ends of the line in our own hands. We hold Vancouver's Island, and we hold almost entire command of the Straits of Magellan in the Falkland Islands. If, therefore, we maintain the positions we have got, and by so doing prevent the only cruisers that can be sent abroad by any enemy, Russia for instance, obtaining supplies of coal, I do not see what we have to fear from vessels employed as the "Alabama" was employed. Our commerce at present is carried on to a much greater extent than ever before by steam vessels. Those steam vessels would find almost along the whole of their route always friendly coaling stations where they could obtain supplies of fuel. But no other country would be in the same position, or scarcely any other country. Consequently, I do not think there is much danger, except perhaps at the very outset of war, when cruisers would start with full supplies on board, which they would afterwards find very great difficulty in replenishing. I do not think, except at the outset of war, much danger need be anticipated ; and probably the increased "risk," in case of war with Russia at this moment, would be no more than a very small addition to the insurance already paid. It therefore shows how extremely necessary it is that we should defend and hold these places, and keep them entirely secure against attack. Therefore I say it would be more advisable to turn our attention to establishing a naval volunteer force which should be upon the spot, and should keep those places in our hands, and prevent them falling into the hands of the enemy, than to drawing upon it to man cruisers and keep open highways, a service which I think would be thoroughly well performed by the Royal Navy. In common with many others, I have read the very able paper in the *Nineteenth Century*, written by Sir Garnet Wolseley, and I am one of the few people who do not agree with it in the least. I think an examination of it—it has been submitted apparently to no examination in any other periodical—would show that the career of that Russian squadron which Sir Garnet Wolseley has painted, has had no parallel in literature, except perhaps the cruise of the "Flying Dutchman." My impression is, if they were to pick up some of these small vessels, of the "Frolic" class, for instance, which he thinks likely, we should be very much the gainers by the fact, and that they would be terribly hampered by such a capture in their possession.

Captain FIELD, R.N. : I did not come here with any intention of speaking, and I did not hear the opening remarks of the lecturer, but as the Chairman has invited me to address the meeting, I will take the liberty of saying a few words. And, first, I desire to say how gratified I am to see the honourable gentleman come here as he

does frequently, to offer criticisms and remarks and suggest improvements in our system of naval defence, and I only wish there were more honourable members in the House of Commons who would take the same interest in naval affairs. It is for want of more men to interest themselves in naval questions that the Naval Service is not adequately represented nor naval policy adequately discussed in that House. But when I turn to the lecture the honourable gentleman has delivered, I have to ask myself what practical good is likely to follow from it. He makes certain very valuable suggestions, but then arises a question, how are they to be carried out? No doubt, as he states, Officers can readily be supplied by the mother country to our various colonies who might assist in any scheme of local defence in those colonies; but, I take it, the mother country cannot be expected to organize a system of colonial defence in colonial waters. Whatever defence we may set on foot would be mainly an Imperial defence, and then our best mode of defending our colonies is on the high seas, meeting hostile fleets or cruisers. But if the honourable gentleman's views are to be entertained at all, they must be entertained by the Colonial Governments, and it would become our Government's duty to invite their co-operation and support; therefore, I should say papers like that which has been read to-day had better be sent forthwith to each Colonial Government, that they may study the question from our point of view. But the honourable gentleman suggests that ships might very well be supplied. He did not quite say how they were to be found, whether to be built and supplied by the Home Government or by the Colonial Governments. I rather fancy he inclined to the idea that the Home Government would supply the ships, and the Colonial Governments the men. Then arises this question—the House of Commons is very jealous of the national expenditure, and if we are to build ships to send out to the Colonies for the Colonial Governments to man, I think people in England will consider if we build the ships and pay for them, we had better man them ourselves, because then they will not be confined to the use of a particular colony, but will be ready for use in any part of the world. I, therefore, think the question of the supply of ships by our Home Government is one not likely to be entertained by the House of Commons or the country. The scheme sketched out by the lecturer seems to me to resolve itself into this, that it can only be used for defensive purposes in their respective harbours, guarding their harbours, whether by torpedo crews or the erection of forts and manning them; so that the colonial port may be safe from a *coup de main* on the part of a foreign squadron. We have at present no colonial navy. There is one ship, I think, in Australia which has been sent out and paid for, but I think it would be a very good thing to invite Colonial Governments to pay certain sums of money to meet the expenditure that will be incurred by the Home Government if they do send out more ships to colonial waters. If the Colonial Governments would be prepared to pay the expenses, the mother country would not hesitate to send more ships out there, and to send out gunners and crews, and to supplement those crews by men raised in the colonial stations, so that after all it resolves itself simply into a pure question of money. Is there public spirit enough in our various colonies to carry out the views the honourable gentleman enunciates? I think there is good public spirit in them, but it takes the near approach of war to stir them up to any exertion. It was only the near approach or fear of war that led to the formation of our great Volunteer Corps in this country, and it will only be the sense of danger which will induce our colonial friends to stir themselves up to form some such corps, whether land or sea forces. But I think they might very properly be invited by this Government to take some measures for their own defence, and not to leave the mother country to do everything for them. They have behaved admirably in Canada in forming local militia corps, and Australia is stirring itself on the question. They have invited an eminent engineer to go and make suggestions as to the best way of defending their harbours. Beyond that, I do not think the mother country can be expected to find funds to protect colonies merely in colonial waters. Whatever funds the House of Commons will vote they will insist shall be expended for Imperial defence generally, and not in sending out ships built in this country to be manned by any colonial force whatever. Those are my humble opinions. I think, whatever can be done by the colonies in the way of local defence will be done on intimation from the mother country, but they must find the money; they must also find the men, and if they will find the money for the ships we can readily supply them.

Captain P. H. COLOMB, R N. : After Mr. Brassey's splendid peroration it is rather difficult to get one's mind back to the facts of the case before us, but the remarks of Captain Bridge and Captain Field have brought us into a more proper frame of mind for discussing the question. At the outset I have to make one little remark of a personal nature. My brother and I, as in the case of the twins in the popular song, get sometimes mixed, and it is difficult to say occasionally which is which. Mr. Brassey has sometimes particularized me, and when he has done so he has always most correctly stated my views, but in the case of proposing to close the dockyard at Pembroke, and to open a dockyard instead at the Antipodes he is quoting the other twin, and consequently I am not to be held responsible for that. I do not mean to say if I considered the question, I should not agree with him ; my brother and I are in very close agreement on these questions, but it is a matter which I have not at all considered, and I have no opinion about it. Wherever Mr. Brassey comes I observe that he brings with him an enormous number of those things which I always express myself as being very fond of, namely, facts. He has given us splendid facts in the paper, as in everything he has written on sea matters : the collection of facts is magnificent. His statement of the growth of the colonies, I am quite sure, puts a new face upon these questions to most of our minds ; for my own part, though I have been considering this question to a certain extent, I never thought before of the enormous growth which has taken place since 1845. It never struck me in that light, but it shows we have in that time altered our position altogether in the world, that whereas we were then a country contained in the British Islands, with some little outlying dependencies, we have now become simply the centre of a great English-speaking Empire. I was very near bringing a book with me, and I am glad I did not, because if I had I should have been tempted to have quoted from it too largely—a book which my brother has drawn up, which is a simple collection of articles from colonial newspapers on this question of Imperial defence, and it is something quite surprising to anybody who will run his eye over those articles to see how ready the colonies are to meet us if we will only go to work to meet them. They seem to say, " You have only to say the word ; let us talk it over ; admit that you will not give us " up ; admit that we are brothers ; admit that the English Empire is not the British " Islands, but is scattered all over the world, and we on our side will stand by you " shoulder to shoulder as long as you choose to call upon us." That seems to be the general tone of the colonial press, and that seems to me to answer Captain Field's question ; and I am very sure of this fact, that every friendly word uttered towards the colonies in any public assembly in England penetrates to the colonies, and is read there, and produces a corresponding friendly feeling towards the mother country, and I am quite certain that that will be the effect of Mr. Brassey's paper here to-day. I recollect reading in some of the debates—in the New South Wales House of Parliament I think, but I am not sure where—a very strong opinion was expressed in favour of trusting to the Royal Navy, and if necessary paying it, for the outer line of defence of their colonies. They seemed to say that they would wish themselves to confine their own efforts, out of the control of the Imperial Government, to the local defence, but they did not seem at all indisposed to bear charges for a force which should not be colonial, but should be used for the defence of their colony, as well as of any other, of course bearing a proportion according to the number of Her Majesty's ships which were present. I hope Mr. Brassey in his answer will make clear the question that Captain Field referred to. I did not myself gather that he meant this : that England was to build the ships, and that the colonies were to find the men. I rather gathered that he wished that a Royal Commission, drawn from England and the colonies, should meet together for the discussion of the question—amongst others—of defence ; that that would be really a detail to be decided afterwards. So soon as any colony had expressed its willingness to contribute its quota, that then the disposition of that quota, and how the money was to be spent, would be decided by a joint Royal Commission. That was what I understood. If it were to be said that an ironclad was to be built by England, and sent out to a colony, to lie there in the harbour to be only manned in time of war, I think I should be rather against that policy. I should rather say that a colony like Australia should provide a quota for the purpose of keeping up a sufficient Imperial naval force for the outward defence, and that then the local arrangements of the colonies themselves should



be entirely devoted to the defence of their harbours against blockade or sudden attacks. Mr. Brassey has very truly represented me in saying I put great faith in a colonial system of naval volunteers, who shall rest the defence of their ports mainly on the use of torpedoes. It is the cheapest mode of defence, especially the spar-torpedo—Mr. Thornycroft's model. It is cheap, and it requires for its use men of great intelligence. The class from which the volunteers would be drawn would be the people to manage such vessels: they would have the necessary resolution and daring to make the attack, and, at any rate, if they did nothing else, I believe they would keep them off by simple fear. But when they had done that, they would leave the Imperial naval force free. We should always know the ports were safe behind us, and we should take care that ships bound to those ports were unmolested on their way towards them. But I should not draw the line so closely as to torpedoes; I would extend it, I think, to the "Gamma" and "Staunch" class of gunboat, a class of ship quite capable of attacking an ironclad, but not capable of keeping the sea, and which seems to be a weapon costing a small sum, and exceedingly available for the defence of ports. I was very much struck with Mr. Brassey's statement of the number of sea-faring men available on the coast of Canada and Newfoundland, and with the facilities which are given for the drill of those men at small inconvenience to themselves on account of the long winter. I cannot help thinking if they, as a small branch of the great matter, were taken in hand, we might be able on occasion to draw on Canada if we wanted it, for I should not be prepared to go to Australia for our seamen. I think the difficulty of the question is this: that up to quite recent years the colonies have been told by us always that, "In point of fact, we do not much care about you, for you can go if you like. You are of no very great service to us: we can get on very well without you. If you give us trouble, we shall say, 'Go.'" It has been the policy of the country for a certain time. That policy, I am quite certain, is reversed, and I hope will never come forward again. I am quite sure as long as the English-speaking nations spread over the face of the earth hold together, it will be impossible for anybody else to make head against us.

Colonel HENRY CLINTON: The speech which has been made by Captain Colomb is exceedingly valuable on many points, especially regarding our conciliatory treatment of the colonies at the present time. If the provinces of North America had been met with such considerate treatment at the time when they were talking of separating from us, they would probably never have separated themselves from England. Then I have to say it is a great mistake to suppose that we can do anything in war if we do not get rid of the Declaration of Paris. There has been a discussion on that subject already in this Institution, and it is therefore unnecessary for me to say anything more; but I am firmly convinced that unless the Declaration of Paris is withdrawn, we can never do anything in war. There is a very speedy method of putting an end to war by sea altogether, if the English choose to make use of it. The fact is simply this, if you will have the goodness to stop the making of large guns for other nations by our own people, if you will put a stop to making torpedoes by our own people, and then warn other nations that no ship will be allowed to leave their ports with a greater thickness of iron or guns of more than a certain size, *then* all naval war would cease, and a *sufficient* number of *ironclad ram-gunboats* would maintain the freedom of all the seas for the benefit of the commerce alike of all nations.

Captain SCOTT, R.N.: Captain Bridge has touched upon a point which is no doubt very important—that is the success of the "Alabama" during the American War. We must, however, remember in regard to the United States losing their trade, that at that time sailing ships were becoming obsolete, and their trade from being principally carried in such vessels was also going down the incline; hence, it only needed a slight push, viz., the additional war insurance, to make the Americans sell their vessels, and their trade to pass with the ships sold to neutrals. This, therefore, is not a parallel case to ours at the present time. With respect to Mr. Brassey's very able paper, I wish again to refer to a point that has been more than once brought forward in this Institution. It is not enough to get weapons *stored in readiness*, but you must have them put into their right place for use in order to be prepared for war. To get guns *ready* to be put on board ship when war breaks out,

is not the way to be prepared for a sudden outbreak of hostilities. We have long been training and at a considerable cost our Reserve seamen: these men are consequently always learning, but for want of *practice* are, I fear, never getting perfect. What the sailors want is, that when they go on board their own merchant vessels they should carry out what they have been taught. Each merchant vessel should, I think, be armed so as to be in herself formidable. Such a vessel, if commanded by a Reserve Captain, and manned in part by Reserve men who had been keeping up their drill, would be far more formidable than any privateer that could be hastily fitted out to attack her. It should be remembered that these merchant vessels would be handled by men second to none in skill; in fact, many of their Captains are first-rate fellows, and I need not point out to you that their ships carry a splendid weapon which is ready at all times, viz., a straight, powerful, knife-edge iron stem. No wooden vessel struck by such a weapon would have any chance of escape. Given an iron merchant vessel going at enormous speed, and with a powerful stem, and you only want to add two or three light guns—not 64 or 32-pounders which would overstrain her, but 12-pounders; and she would then obtain the character of an armed vessel, and thus give the men confidence in protecting themselves. Besides the light gun and the knife stem there is the spar torpedo, a weapon which our Reserve seamen can easily handle; and as most of our merchant steamers carry whale boats they could be at once provided with an additional means of efficient defence. Then, as to Canada, the merchant ships belonging to that country—manned by their splendid seamen—would be really a very powerful supplement to our force of regular men-of-war if proper arrangements were made in time of peace. We have now got into a habit of considering the ironclad only as a man-of-war, but these merchant vessels are, at least for all points of *defence*, equal to most of our wooden vessels in their speed, in their power of ramming, in their sustained steaming, and in their sea-keeping powers. Turning to what Mr. Brassey has said about the armament for our colonies, I think it is necessary to commence on a small scale of expenditure, and that what is most wanted is first to enrol the seafaring men that are on their coasts for coast defence; likewise to enrol all the traders and their seamen as a naval Reserve, and not to incur the expense of building special war vessels, but rather to utilise all existing means of defence. Let the men be enrolled and also the vessels and boats in which they are accustomed to go to sea, and then what more simple than to drill and afterwards to put torpedoes on board them? In addition to the torpedo armament, which I look upon as mainly serviceable for the purposes of defence, you have in your colonies an energetic seafaring people that could be easily organized for defence; and I believe it could be done at a very small cost. My own idea is, that from the instant the Reserve men are called out for drill they should be taken to practical work; let them be put to fortify those positions which are most important, and to make roads to and from them along the coast line. There are no fortifications so cheap or more efficient than sand banks and earthworks. Therefore, your shore drill should commence with erecting such defences, and your naval drill with firing torpedoes, which should be kept at all times ready for use. The colonists, as we hear on all sides, are quite ready to do their part, and I do believe that if that part were pointed out by a Royal Commission, it would have most important results. It would certainly show to other nationalities the latent force and power which this country really possesses. We have seen some newspaper articles lately which tend to give foreigners a very imperfect notion of the actual resources of this country; these affirm that our Empire is so scattered that it has an inherent source of weakness. I venture to maintain, on the contrary, that its extension is an inherent source of strength, for our colonies, settlements, and coaling stations now girdle the earth, and would enable us to keep the seas in time of war. I again affirm that all our ironclads should be sea-going, and that a coast defence ironclad is an anomaly; and I believe that this paper is likely to be of very great service, and I for one think that our hearty thanks are due to Mr. Brassey for coming forward and reading it on the present occasion.

Major-General LOWRY: I beg, as a military man, to express my humble but warm appreciation of the opportune and admirable paper which has been brought with so much pains before us to-day by Mr. Brassey. I rejoice to know that he is

a Member of Parliament, and I trust that many Members of Parliament will be inoculated with the same ideas, and that the very forcible suggestion which he has put before us of a Royal Commission being appointed to inquire into this matter, and so bring it to bear upon our colonies that a system of defence by naval volunteers may be adopted; they will at once strengthen the hands of the mother country and the colonies, and which will be a source of gratification to both. I can, from many years spent in Canada, fully confirm what you, Sir, have said and what Captain Colomb has brought out as to the warmth of the feeling which exists in those colonies towards us, especially in that great dependency of ours of British North America. There are no warmer hearts towards Britain than beat there, and it only requires this country to speak to them and to put forward some system which will draw out their wealth of men and money to enable that country to do much more than she is at present doing for her own defence. We must all feel it, and those especially who have been much in the colonies, that they are not only the peculiar glory, but that they will be the great living strength of this great country; and the more we keep warmly towards them, and the more we develop their love and feeling, the more in the end they will respond to us and become our outlying towers of strength. At this time we are reading in the papers day by day of a threatened Fenian attack on Canada, and I think some gunboats are being placed on the lakes. I have had no connection for some few years with Canada, and I do not know whether crews from our men-of-war at Quebec and Halifax have been furnished for these gunboats, but it certainly would be a most desirable thing if there were always present on the minor lakes of Canada, gunboats thoroughly manned by our Canadian comrades. It is a matter comparatively unimportant whether officered wholly or partially by our colonists. That would be easily settled by a Royal Commission; but that gunboats in a state of thorough readiness and efficiency should be there, that the spirit of our Royal Navy burning in the bosoms of these Canadians should be rightly guided, is a matter of the greatest importance, and for the whole of Canada it is most desirable that some system of naval volunteers should be adopted. I do trust that all that all of us can do, will be done to press forward the matter of a Royal Commission being appointed. Believing it of greatest moment to the future of the country that some system for the defence of our great Colonial Empire should be adopted, and that soon, I for one heartily thank you for the admirable paper you have read.

LORD ALFRED CHURCHILL: I entirely concur in the observations of Mr. Brassey as to the necessity for a Royal Commission composed of representatives of various colonies being appointed for the purpose of investigating this question, and putting it on a proper basis. The observations I wish to make apply more especially to the Australian colonies. There are several colonies within a group, at present somewhat sparsely peopled, and there may be some difficulty in organizing for them a sufficient naval force. However, I think that at present their first endeavour should be in the formation of earthworks at the entrance to the harbours. Most of their harbours are easily defended by means of artillery and torpedoes, and at present there is, I think, one ironclad there, the property of Victoria. I should hope in time we may see, if this question develops itself further, a colonial fleet of ironclads for that especial group; but I think for that purpose the colonies should federate themselves. At present they are all entirely separated one from another, having no sort of control one over another, and it would be necessary therefore for the Home Government to organize a confederation scheme for defence which should be submitted to the colonies and receive their assent. In that case you might arrive at some principle by which they should contribute to the formation of an ironclad fleet for coast purposes, and at the same time as to what amount or proportion of support or assistance should be rendered by the Royal Navy. But in order to do this, I should like to understand what is the nature of the Mutiny Act under which they can serve. Would a naval volunteer serve under the Mutiny Act of the Imperial Government, or have they a Mutiny Act of their own? It may be necessary, in order to carry out my scheme, that the Imperial Government should themselves pass a Mutiny Act applicable to the whole of that group. The same principle would apply to other colonies in other parts. I think that is a question which no doubt will come under the consideration of this Royal Commission. What we ought to do now is to



urge, as a commencement, the appointment of a Royal Commission for the purpose of commencing and investigating this thing. And the Imperial Government should themselves take the initiative in this. You cannot expect the colonies to do it for themselves. It is the duty of the Home Government to take the initiative. I cannot conclude without expressing my own thanks for the admirable paper Mr. Brassey has just read to us: it is not the only occasion on which we have felt deeply indebted to Mr. Brassey for his exertions in this direction.

Major BAYLIS, Q.C.: I have attended many lectures at this Institution, but there have been none in which I have taken a more warm and deep interest than the present. It has given me, and I am sure those who are here present, great pleasure to be here and to have heard the able paper read by Mr. Brassey. There has been much good done in this Institution by the lectures and by papers read here; they have been read in this small room, but the benefit has extended far and near. I think it may also be said of Mr. Brassey's paper that the good which has been done by reading the paper here will be extended far and wide. And it will have this advantage to us, because the good attaches to those who are bound to us, namely, our colonies. I believe the dependencies of England, when they read this paper, as emanating from the United Service Institution, will see that we are alive to the evils in which war may involve them. It is a serious matter, no doubt, for our colonies to feel and know that, when our statesmen think war may be necessary, they too may themselves be involved in war, but they will be glad to learn that this country is also sensitive to its duties, and will do everything to aid them in case of war. I know nothing that will do so much good as the paper which has been read to-day, for we know the value of the self-dependence which it inculcates, at the same time it shows that we care for their interests. I do not believe the colonies wish that England should give them all and every assistance, but what they want is to know what England expects of them, and what England will suggest to them to do for themselves, in addition to aid from the mother country. Well, now that paper suggested that they should, on their part, put their own house in order—that they should look to self-defence and self-reliance; and although, if England be involved in war, we might not look to our colonies and dependencies to defend us, they will, I believe, if necessary, Canada and all the countries connected with dear old England, always stand by her, and I was delighted to hear—unmistakably from those hearty cheers—to-day that dear old England wishes to stand by her colonies, although it has been suggested by one that England wished to be disunited from her colonies. I am sure when they feel that we are on the right course now, that we are endeavouring to suggest to them the best means by which they may be prepared in case of war, they will thank us for this paper, and I have no doubt that these valuable suggestions will lead to very much greater results. I cannot help thinking myself, in my own humble way, it will lead to a communication between the heads of the Government here and the authorities in our colonies, by which they will put their heads together to bring about the best means of rendering efficient defence to the colonies, who will suffer in case of war with England. I do not think it stops there, for I believe the colonies will do their best also to assist England. There is one thing which has relieved my mind considerably, and that is with regard to the "Alabama." We are very glad to hear that that is not a parallel case, and that what happened in the case of the "Alabama" is not possible with us now, and that England is not likely to suffer so much as the Americans suffered, or at all, from these hostile cruisers. This is a great relief to my mind, and I think we have heard very good reasons for it. Our vessels are mostly steamers, and can, therefore, take care of themselves better than was the case with the sailing vessels of the Americans, which fell a prey to the steamers.

Captain HULL, R.N., Hydrographic Department: With reference to the remarks made by Captain Bridge, I may tell him his hopes, with regard to the native sailors of India, have already been, in some respects, realized. I allude to the work now going on under the Indian Marine Survey Department, and, though it may be said that such labours are rather in the service of peace than of war, still, as the old Napoleon managed to conquer Europe by having good maps and knowing how to use them, so (and here I am sure all sailors will agree with me) success in a future naval war will, on the same grounds, greatly depend on our Captains having good

charts and knowing how to use them ; therefore, I can say the native sailor of India has already done good work in the defence of that Empire, for when, through the energy of Mr. Clements Markham and Captain Taylor, the Indian Survey was established in 1875, although the Officers were supplied by the Admiralty, the men were found in India. Captain Taylor's staff has already surveyed Moulmein, Rangoon, Chittagong, False Point, Coringa, and Madras. One party is now working in Palk Strait, while Navigating Lieutenant Jarrad and another party are surveying the west coast of Hindostan, to the south of Bombay, the whole of that important part of a survey, the soundings, being taken by native sailors.

Mr. BRASSEY, in reply, said : I am very much obliged to those Officers who have spoken, for the too kind manner in which they have referred to my paper. I was much flattered by the invitation I received from the Council of this Institution inviting me to prepare a paper on the Colonial Naval Reserve ; and if what I have written has any effect in setting in motion a scheme for organizing our resources for colonial self-defence, I shall feel thankful that I have been engaged in such a useful task. The point has been referred to by several speakers as to the mode in which the expenditure necessary in carrying out such a scheme was to be dealt with. Captain Field very truly said, after all this is a matter which cannot be undertaken without an expenditure of money ; and speaking as a member of the Legislature, I fully appreciate that aspect of the case, and consider that it will require very delicate handling to settle it satisfactorily. Now the foundation of a practical scheme must be, as I have endeavoured to point out, an inquiry by some competent and fully representative body, and I cannot conceive how a more effective mode of inquiry could be devised than that which would be provided by a Royal Commission. As everybody has said, the initiative must be taken by the mother country, and the best mode by which the mother country can point out what is required to be done, and bring home to the appreciation of the colonists the necessity for doing what is necessary, will be provided by giving them the full report on the subject from a Royal Commission composed of naval and military authorities and representatives of the colonists, who would be able to speak on behalf of the Colonial Government as to the ability and willingness of the taxpayers in those colonies to contribute their share. I do not think one can speak definitely on this point until we have had this essential preliminary investigation. No doubt the Commission would begin, as individual writers on this subject have begun, by laying down what are the important and strategic points which you have to defend. Some of these strategic points being coaling stations, necessary bases for naval operations, would be ports of very flourishing trade. We may fairly look, in such a case as that, to the mercantile community to contribute what is necessary. In other cases you have an important strategic point which has not a flourishing trade, which is important in a naval point of view, but not in a commercial point of view ; such, for instance, as the Falkland Islands, or perhaps Vancouver. You could not reasonably expect, in such a case as that, that the expense would be met from any other source than the national exchequer. Gibraltar and Malta are important strategic points and defended, and I think very properly so, at the expense of the mother country. I now turn to the question very properly raised by Captain Field with reference to the ships. Those ships which may be considered necessary for the local defence of a flourishing commercial colony would, I think, belong to and be paid for by the colonies. Those ships which you might think it necessary to build for the local defence of places like the Falkland Islands would necessarily be paid for by the Home Government. Each case would have to be dealt with with reference to its local and special circumstances, which would be no doubt properly appreciated by the Royal Commission. I am glad that what I have said with reference to Canada and Newfoundland has been approved by those naval gentlemen who have spoken. In Canada there is a most admirable field for the organization of a naval reserve. There is a large sea-faring population, hardy and loyal, and valuable in every way for naval purposes, and from the necessity of the case unemployed during a considerable portion of the year. And when we come to consider how near the shores of Canada and Newfoundland are to this country, the facilities for communication by telegraph, the means you have of bringing to this country, if required, a very considerable force, so that in a fortnight from the time when your appreciation of the necessity had been formed, you might have your

Canadian reserves in your home ports, ready to man your ships ; when you come, I say, to consider all these things, it must be acknowledged that we have too long neglected a very valuable source of naval power, and one which I trust will be developed by such an organization as the Admiralty with very small expense might very easily establish on those coasts. I am glad to be reminded by my friend Captain Bridge of the resources we have in India. India I look upon as a precious jewel in the national diadem, but it involves the country in immense responsibilities. I will not enter into the question now, but the day may come when it may be to some extent a financial burden to this country. In any case it is satisfactory to know that we not only have responsibilities and burdens to bear in connection with India, but that we derive sources of strength from our Indian connection. I was glad to hear from the observations which fell from Captain Colomb that there has been an expression of opinion officially and in Parliament in the colony of New South Wales to the effect that the colony would be willing to contribute its proportion to the maintenance of such vessels of the Royal Navy as might be permanently stationed in the colonial waters. I think we might reasonably expect such a view to be entertained in a wealthy and increasing colony. I cannot answer the questions which have been raised about the Mutiny Act as a lawyer, for although called to the Bar, I have never practised in the profession.

I thank you very much, and can only say, as I have already observed, it has been a work of great satisfaction to me to have been called upon to prepare this paper ; and if it does tend to set a movement on foot which will be of practical value, I shall have been very proud to have taken some part in the matter. With reference to Parliament you must all appreciate this—it is very difficult to rouse the attention of Parliament to new subjects. In such a case as the one which we are discussing, an expression of opinion by the members of the United Service Institution is of great value as an initiatory step before bringing any proposals relating to a Colonial Naval Reserve before Parliament and the country.

The CHAIRMAN : Before I ask you to vote, as I am sure you will with acclamation, your thanks to Mr. Brassey for his very able paper, I would remind you that he possesses peculiar qualifications for speaking to us on this subject. In the first place he commands the body of Naval Artillery Volunteers in England, and he has just been round the world, where he has just visited our colonies and has seen how necessary it is that this step should be carried out. I met him at Hong Kong, a colony in which there is no volunteer force. Hong Kong is a most important British colony, and yet a man might walk for days about it without finding a fort. It is absolutely undefended, except by a few insignificant guns. Singapore is also absolutely undefended. We have in the China and Japan Seas not exactly colonies, but settlements very much of the nature of colonies, viz., settlements on the main land in the treaty ports. It is very difficult to persuade the English inhabitants to move in this matter of creating a volunteer force. Englishmen in those distant parts may fight well enough when driven into a corner, but they for various reasons will rarely combine together to form volunteer forces and submit to drill. You may find at one port some one or more enthusiasts who take the question up, and I do not know what we should do without our enthusiasts, as they form a nucleus. Thus we have, as at Shanghai, a very respectable volunteer infantry force—there is a small force of cavalry and Gatling guns—very much the kind of force that Mr. Brassey has spoken of, that is what we want in all our colonies, as I understand from his paper ; and I entirely agree with him. The only difficulty is to start them. I see no reason why the Act authorizing the enrolment of volunteers should not be extended to the colonies and to the treaty ports of China and Japan, and that promptly. We are honoured to-day by the presence of some ladies. Depend upon it that there is a great deal in the power of the ladies in this question. I speak quite seriously. If the ladies in the colonies and settlements referred to would look shyly on any young men who were not enrolled in a corps of volunteers for the defence of the ladies themselves, and of the British interests, then I believe we should find all our colonies and all our outlying settlements thoroughly well defended. I have very much pleasure in returning our thanks to Mr. Brassey for his very able lecture.



## LECTURE.

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Friday, June 7th, 1878.

GENERAL W. A. McCLEVERTY in the Chair.

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### THE NATIVE STATES OF INDIA IN SUBSIDIARY ALLIANCE WITH THE BRITISH GOVERNMENT.

By Colonel G. B. MALLESON, C.S.I., late Bengal Staff Corps.

It will be my object this afternoon to place, in a concise form, before the members of this Society, some materials from which they may draw conclusions regarding the strength of those native states in India which are in subsidiary alliance with the paramount power, and the chance of success which might await them in any contest with that power.

Throughout Hindustan there are six groups or divisions of native states. They may be classified under the names applied to the parts of the country they inhabit. These are—Rajputana, Central India, Western India, Southern India, Eastern India, Northern and North Western India. For aggressive purposes, four of these, for reasons which will be given hereafter, may be dismissed at once from consideration. There remain the fifth and sixth—Southern and Central India—comprising Haidarabad, Mysore, and Travankor, the great Maratha states of Gwalior and Indur, the Mahomedan state of Bhopal, and the small Rajput principalities of Dhar and Diwas. Of all these, Haidarabad, Gwalior, and Indur are alone really formidable.

Before alluding to the aggressive capacities of the states of Southern and Central India, I propose to glance at the conditions of the native states in the other parts of the country, and to show why it would be impossible for them seriously to irremediate the paramount power.

In Northern and North Western India the most important native province is Kashmir. A glance at the map will show that Kashmir is shut in between lofty mountains and British territory. The mountains

are behind it; British territory lies in its front and on either flank. It is, in fact, a portion of British territory severed from it, protected by passes inhabited by a race always content to serve, always governed by alien rulers. Kashmir has ever obeyed the ruler of the great province—the Punjab—from which it was severed in 1846. When Mogol rule was dominant in that province, Kashmir was Mogol; it subsequently succumbed to the great Sikh ruler who rescued the Punjab from Mogol sway. It was ceded to the British in 1846, and by the British was transferred, the same year, to the father of the present ruler—the Sikh chieftain of Jammu. The population is 150,000; the number of armed retainers amounts to about 20,000; the number of guns to 96. But the armed retainers include a number of undisciplined men, but slightly armed, and the guns are of the rudest description. For aggressive purposes against the British the country is as though it were disarmed, and no one is more conscious of this fact than the Raja of the country himself.

On the same side of the Satlaj as Kashmir are the states of Kapurthala, Mandi, Chamba, and Saket. The joint population of these states is under 600,000, and none of them are or could be, in the smallest degree, formidable for aggressive purposes.

The Raja of Patiala, on the south bank of the Satlaj, is more formidable. The area of his country exceeds 5,000 square miles; the population numbers more than 1,500,000. His territory joins the territories of the Rajas of Jhind and Nabha. The three Rajas are Sikhs, all descended from the same stock. The joint population of the three states just exceeds 2,000,000. Yet, of armed retainers of all sorts, there are but 3,500, and of guns but 27. The people are Sikhs, given greatly to agricultural pursuits. A glance at the map of India will show how entirely these small states are hemmed in by British territory, and how impossible it is that they could successfully lend themselves to aggressive action.

The smaller states of Kalsia, Maler Kotta, and Faridkot, may be dismissed without remark. Bhawalpur, which is more important, is mainly so because it is a link between the Punjab and Rajputana. A long narrow tract, it is bounded on the north-west by Sind and the Punjab, and on the east, south-east, and part of the south by the Rajput states of Bikanir and Jaisalmer, and by Bhattiana. The majority of the inhabitants are Mahomedans of Beluchi and Afghan descent. They number only 365,000. The Nawab or ruler has but 3,000 armed retainers of sorts, and 80 guns of kinds. Regard being had to the straggling nature of the country, its exposed position, its scanty population, Bhawalpur may be relegated to the list of those states which, under no circumstances, could be formidable for aggression.

Bhawalpur takes us from the north and north-west entirely, and leads us to Rajputana. The times have been when Rajputana concentrated within herself the fighting strength of Hindustan. They were princes and people of Rajputana who opposed the most stubborn resistance to the earliest Mahomedan invasion from the north. They were princes and people of Rajputana who first nobly resisted Akbar and the Mogols, who subsequently, submitting to the overlordship of

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# INDIA

Scale 1:500,000 (One inch to 300 Miles)

0 50 100 150 200 250 300  
ENGLISH MILES

Native States shown thus

Railways shown thus

the dynasty of Baber, constituted the most important portion of the vast empire ruled from Agra and from Delhi. They were princes of Rajputana who commanded the armies of their Mogol overlord, and who brought to every field contingents of their own kith and kin who would die rather than quit the ground. In those days the Rajputs of Rajputana were the life-blood of Hindustan. Where are they now? They fell with their Mogol tyrants. The crash of the great empire they had upheld carried them away with it. They fell with its fall. The Maratha freebooters who rose, no one knew how, out of the ruin of the Mogol empire, overran their territories, and sucked out their very life-blood. History offers no nobler story than that presented by Rajputana for the period intervening between the rise of Akbar and the successful installation of Aurangzib; no sadder picture than it presented during the hundred and odd years intervening between the death of Aurangzib, in 1707, and the final crushing of the Maratha power by the Marquis of Hastings in 1817. It was the history of the decay, the ruin, the abasement of a great people.

Rajputana exists still. Its kings are the lineal descendants of the heroes who flourished long prior to the time of Akbar. Its people are the sons of those who defended Chitor, and who fought for empire at Kanua and Biana. But her life has died out. The good blood that was in the veins is now dry and hard. The charms of opium have succeeded to the song of battle, and the pleasures of the harem to the joys of strife.

Yet it may excite some surprise to hear that throughout Rajputana at the present moment there are 93,000 armed retainers of whom at least one-fourth are horsemen, and about 2,000 guns of sorts. But the remark made regarding the guns and the retainers of the Raja of Kashmir applies equally to these guns and to these men. The guns are all of the oldest pattern and for the most part small and worthless. The armed retainers are not soldiers, nor do they pretend to be so. At the most they have a sword or a matchlock. They have never been drilled, and in no respect are they formidable.

There are in Rajputana eighteen states in subsidiary alliance with the British Government. They are called Udaipur, Jaipur, Jodhpur, Bundi, Kota, Jhalawar, Karauli, Kishngarh, Dholpur, Bharatpur, Alwar, Bikanir, Jaisalmer, Sirahi, Dongarpur, Banswara, Pertabgarh, and Tonk. Of these the last alone is ruled by a Mahomedan—the descendant of the famous freebooter, Amir Khan; Bharatpur is governed by a Jat prince; the other states by Rajputs. The population is mainly Rajput. It is among these eighteen states that are apportioned the 93,000 armed retainers and the 2,000 guns of which I have made mention. To utilize these men and these guns, if indeed they were capable of being utilized for aggression against the paramount power, the union and combined action of eighteen different independent states would be necessary. The history of the past in India shows such union and such combined action to be impossible. Ceremonial and etiquette constantly interfere even with social intercourse amongst these high caste princes; much more would it prevent joint and secret action. Of Rajputana, then, extensive as is the country, brave and

warlike as were once the people, it may be said that even were her princes united she would not be formidable for aggression, and that, divided into eighteen states independent of each other, she is powerless.

Turning now to Western India I find here five principal states, the remainder being minor and subsidiary. The five principal states are Barodah, Kolhapur, Sawant-wari, Kachh, and Kathiwar. None of these are formidable for aggressive purposes. Barodah, with a population somewhat below 2,000,000, maintains an armed force of about 14,000 men and 30 guns. Some of these 14,000 men are well dressed and well drilled, but they are essentially show soldiers. The Gaikwars of Barodah have never played a prominent part in the history of India; they have been always second to some one else. They are so now to the English, and they will, if they are wise, be content to remain so.

Kolhapur, though ruled by a descendant of the younger branch of the family which gave birth to the famous Sivaji, is even more debarred than is Barodah from aggressive power. Disaffection or misgovernment in this state has always been easily suppressed by a small British force. The armed retainers number about 1,600 men, and though there are said to be 258 guns in the country, none of them are worth much. Sawant-wari, Kachh, Kathiwar, and the minor states may be summarily dismissed without remark.

Passing from Western to Eastern India we find there only petty chieftains, none of whom possess power for aggression. The states are all mediatized or minor, and their rulers, though nominally Rajas, are really only large landowners.

In Southern India, as perhaps in all India, the most formidable state is Haidarabad. Mysore, which in the last century, under its Mahomedan sovereign, used to threaten Madras and lay claim to give law to the southern portion of the peninsula, has long been powerless for aggression. The masterly policy of Marquis Wellesley reduced her in 1799 to nothingness. She was shorn of half her dominions, and salient positions in her territory were occupied by British troops. The misgovernment of the representative of the restored Hindu ruler rendered it necessary for the British, in 1833, to tighten their hold on the country. British troops, native and European, occupy Bangalor, and a station close to the far-famed but dismantled fortress of Seringapatam. The once renowned horsemen of Mysore are now under British command. The armed retainers of the minor Raja number but 1,000 infantry, some 35 cavalry, only half of whom are mounted, and 6 small guns. The people are industrious, much given to the cultivation of the soil, the yield of which is ordinarily far more than sufficient for the wants of the population. Out of a population of 5,000,000, the Hindus greatly predominate.

This short summary of the present state of Mysore renders it almost unnecessary for me to state that for purposes of aggression against the paramount power she is not to be counted upon.

Similarly with regard to Travankor. The armed force at her ruler's disposal does not exceed that at the disposal of the Raja of Mysore. The people, almost entirely Hindus, are unwarlike in character, and throughout their history have never carried on a war of aggression.



The same remark applies to the people of the small neighbouring state of Kochin. The armed force in this state amounts only to 300 men, and it has but 3 small guns.

It is different in Haidarabad. Independently of a contingent force of 5,000 infantry, 2,000 cavalry, and four batteries of artillery, commanded by British Officers, and paid for out of the revenue of lands assigned for that purpose by the Nizam, that prince maintains a separate force little short of 50,000 men. Of these nearly 37,000 are infantry, the cavalry amount to 8,200, and there are 725 guns. These troops are not the rabble which go to form the armed retinue of some of the princes of whom I have spoken. Amongst them are Arabs and Africans, strong of limb, active by habit, and turbulent by nature. These for the most part occupy the city of Haidarabad, and in periods of excitement they have shown themselves extremely difficult to restrain. In the crisis of 1857 they burst the bonds that held them back and attacked the British Resident in his palace. The period was critical. It was the middle of July when the disasters of Mirath, of Delhi, of Cawnpore, of Lukhnow, were as yet unavenged, and when a strong feeling pervaded the native mind that the knell of British rule had sounded. Had Haidarabad, with its population of over 10,000,000 and its army of 50,000 men, turned against us at that moment, it is difficult to see how we could have held Southern and Western India. It happened fortunately that the Prime Minister of the Nizam, the present Sir Salar Jung, was a far-seeing statesman. He believed in the fortunes of Great Britain, and he felt that if revolt were to be triumphant it was neither the Nizam nor the Mahomedan nobles of Haidarabad who would reap the fruits. Without hesitation, then, he summoned troops upon whom he could depend, attacked the rebels, and dispersed them. From that moment the excitement subsided; Sir Salar Jung was supreme, and he gave all his influence to the maintenance of a cordial understanding with the British.

Still it is undeniable that for aggressive purposes Haidarabad might be formidable. Alone, I think, of all the reigning native dynasties in India, the Nizam occupies towards the British the position which his predecessors—the Subadars of the Dekhan—held towards the Great Mogol. The large colony of Mahomedan nobles who form the court of the Nizam are, for the most part, descendants of the nobles who, in the days of Mogol rule, followed the Subadar or Viceroy from Delhi to Haidarabad. The people number amongst them many Mahomedans, but the majority are Hindus. It has so happened that the ruler of Haidarabad has never been embroiled with the English. Inclined, during the war for empire in Southern India between the French and the English, to side with the former, they accepted the decision of fortune and remained—with a slight exception in 1767 of which they speedily repented—true to the English overlordship. The reigning family has been guiltless of producing one man of real ability, and the British Resident on the spot has always exercised great influence in directing the policy of the representative of the house. Still it must never be forgotten, in computing the dangers of India from within, that Haidarabad is a compact state ruled by Mahomedans,

with a population of nearly 11,000,000—an independent Army of nearly 50,000 men, many of them chosen troops, and 725 guns.

Inferior to Haidarabad in extent, in the amount of its population, and in wealth, though scarcely inferior to it in aggressive power, is the Maratha state called Gwalior. The past history of this state, and the past history of the house of Sindia which rules it, make it in a certain view more dangerous than the other. The house of Sindia has a past more brilliant, more powerful, more alluring than the present. It was the greatest representative of that house, Madhaji, who struck the blow which lodged the Maratha in the palaces of the Mogols. It was the successor of Madhaji who, in 1803, contested the empire of Hindustan with the British, and who, dreaming of renewing the struggle in 1817, was outwitted by the Marquis of Hastings and compelled to recognise the supremacy of his successful rivals. In the minds of capable members of ruling families that have been great, the past is always a dominating power. The present ruler of Gwalior is pre-eminently a capable man; he is above all things a soldier; he understands how to manœuvre troops; he is alive to the improvements effected of late years in the scientific branches of the military profession, and he has ever shown himself anxious to secure for himself the advantage of those improvements. He occupies a central position in India; he is in the prime and perfection of manhood; he is his own Prime Minister, and within his own dominions absolute ruler.

The dominions of Sindia comprise 33,000 square miles. The population, mostly Hindu, numbers nearly 3,000,000. The annual revenue is about 1,000,000*l*. By the last treaty with the Government of India Sindia was empowered to maintain a regular army of 5,000 men and 36 guns. He does maintain a regular army of that strength, but in addition to it he can dispose of an irregular force numbering about 17,000 infantry and cavalry, and 170 guns of sorts.

The past history of the wars of Sindia with the English gives an apt illustration of the advantage accruing to the native army from the presence in its ranks of European officers. Until the battles with the Sikhs on the banks of the Satlaj in 1846, there had been no more hotly contested engagement than the battle of Laswari. Laswari was fought on the 1st November, 1803. The Maratha army numbered but 9,000 men, of whom 1,500 were cavalry, and they had 74 guns. But the 7,000 men who composed the infantry were the picked soldiers of India. They had been trained in the European system by the famous De Boigne, and were armed with the best muskets then procurable. Until within a few weeks of the battle the regiments had been drilled and commanded by European officers. Under the leading of these officers they had beaten every enemy whom they had encountered. But their European officers, ready to lead them against the native enemies of Sindia, had felt a great repugnance to do battle against English troops. Possibly they were not uninfluenced by the offers made them on the declaration of war by Marquis Wellesley—offers which secured to them their property and a provision for life. This at least is certain, that they left the trained battalions to shift for themselves. Here, then, were 9,000 trained troops—splendidly trained

troops—but with no Europeans to guide them. On the morning of 1st November Lord Lake attacked them in a very strong position with his cavalry, composed of three regiments of dragoons and five of native cavalry. The position of the Marathas was so strong, and they had been trained so well, that the cavalry attack was repulsed, and Lord Lake was constrained to draw off and await the arrival of his infantry. At noon the infantry, who had marched twenty-five miles, came up. They consisted of one English regiment, the 76th, and four native regiments—in all about 4,000 men. Lord Lake's whole force, including cavalry and artillery, numbered about 7,000 men. The disparity then was not very great. It is interesting, especially at the present day, to notice how these trained sepoys, commanded by their own countrymen, met and encountered the English soldiers, and the sepoys commanded by English officers.

Lord Lake allowed his soldiers an hour to rest and take their food. He then formed his infantry into two columns, the first of which was to turn the enemy's right concentrated round the village of Mohalpur, the second was to support it. Whilst this real attack was taking place one-half of the cavalry were to threaten the enemy's left, whilst the other half should hold itself in readiness to take advantage of any confusion in the hostile ranks.

These dispositions having been effected, the first column moved on; but its advance was no sooner noticed by the Marathas than they threw back their right, and concentrated on the advancing column the whole fire of their artillery. The fire was most effective. The heads of the advancing column were smitten down, and the losses were enormous. But Lord Lake was aware that the one way to beat Asiatics was to move straight on; the column, therefore, still pressed onward. In vain did the enemy, suspending for a moment his artillery fire, send his cavalry to check the advance. The cavalry were repulsed; the column still pressed on and deployed, whilst our cavalry charged the guns. Admirably trained, formed of the same material as the majority of the attacking force, slightly superior in numbers, occupying a strong position, the enemy showed on this occasion a courage and resolution scarcely to be surpassed; but their leaders were not up to the mark. They had no trained European officers to call upon them to do the right thing at the right moment. In the contest that followed this deficiency decided the day. Whilst their cavalry had fallen back ours had advanced and ridden over the gunners. Our infantry, following up the cavalry charge, took possession of the greater part of the guns. The two arms, acting in concert, then drove the enemy from every position; not, however, before each had been most stubbornly contested.

I have mentioned Laswari as affording the best example of a battle fought by a purely Maratha army against a force of combined European and native troops, the latter led by English officers. It proves, as the actions on the Satlaj and in the Punjab proved subsequently, that native soldiers will fight splendidly, even against Europeans, that they only require to be led. Side by side with English troops, and opposed to an enemy whom those English troops are eager to encounter, they would vie with their English comrades. This spirit of their



English comrades would communicate itself to them and would animate every nerve. At Laswari fighting against the English without officers to lead them, they displayed, writes the historian and eye witness, Major Thorn, "a firmness of resolution and contempt of death" which could not fail to command the admiration of their opponents." But it should never be forgotten that of the regiments opposed to them but one was British. The others were their own countrymen, not better drilled than they were, but led by English officers.

Subsequently to the campaign which the battle of Laswari virtually ended, Sindia but once again met the English in the field. This happened in 1843. But the circumstances were peculiar. Intriguers had taken advantage of the minority of the present Maharaja to embroil the country with the British. Their army had lost the training imparted to it by De Boigne and his followers. They were a rabble possessing some good guns. Met by the English at Maharajpur they still showed courage, but they made no stand at all to be compared with that at Laswari.

During the mutiny, the Maharaja, in spite of the fact that his very kinsmen revolted against him, remained faithful to the British. His troops turned against us. But it was as an ally of the Maharaja that Lord Strathnairn stormed his capital in 1858, and that subsequently Lord Napier of Magdala restored order in his dominions.

The Maharaja is a good soldier. He has at his disposal, as I have already stated, a small well-disciplined force of 5,000 men and 36 guns, and he can dispose of an irregular army of 17,000 men and 170 guns. Granting that he were ill-disposed towards the British, his means of aggression are not very formidable. It is well, too, to notice that they are not without a very powerful counterpoise. The famous fortress of Gwalior, overlooking his capital, is occupied by British troops, whilst a small but admirably equipped force of the same troops of all arms occupies Morar, a station also within sight of his capital. So long as these positions are occupied the Maharaja is debarred from aggression. As well might a man with disease of the heart attempt violent exercise. In occupying Morar and the fortress of Gwalior we prevent the possibility of extraordinary locomotion on the part of the owner.

Far less formidable for aggressive purposes than Sindia is his fellow Maratha, Holkar. Holkar rules over a straggling territory in Central India containing about 8,400 square miles and occupied by a population of little over half a million, mostly Hindus. His armed retainers number 8,500, and he has 102 guns of sorts. The instincts of the present representative of the house are rather money making than martial.

The Holkars of Indore have indeed twice felt the power of the English. In 1804-5 after a campaign which had begun by the enforced retreat of Colonel Monson, for want, Rao Holkar fled completely beaten to the Punjab, whence he returned—to use his own words—"with his kingdom on his saddle's bow" to the conqueror. In December, 1817, the Pathan chiefs, who during the minority of the minor Raja, swayed the fortunes of the state, encountered the English at Meludpur. They were hopelessly beaten. One day sufficed to place

the dominions of Holkar at the feet of the British. Holkar, then, individually as a state, can scarcely be regarded as formidable for aggressive purposes.

One word regarding another state in Central India—I mean Bhopal. This country adjoins Holkar's dominions to the eastward of them. Its ruler and the court are Mahomedans, as are likewise a large number of the population of the chief town. It contains 6,760 square miles, and nearly 700,000 inhabitants. The number of armed retainers maintained by the Begam is about 6,000, and she has 39 guns of sorts. Bhopal has from the earliest times displayed an unswerving friendship for and loyalty to the British. In the most trying times of the Mutiny, when other states wavered Bhopal was true. The dynasty which rules it has never shown any love for aggression. A small colony of Mahomedans planted in the midst of a large Hindu community at the time of the break-up of the Mogol Empire, the descendants of that colony have been satisfied to maintain the dominion of their fathers. The circumstances of their origin may account to some extent for their early sympathy with the British. Afghans in Central India were as much foreigners to the Hindu population as were the English.

I have now passed in view singly one after another the only native states in Hindustan which might possess the power, had they the will, to cause serious trouble to their overlord. Singly, it will be seen they are comparatively harmless. But to the reader who, glancing at the table which forms an appendix to this lecture, may notice that the native states of India, united, can dispose of 64,172 cavalry; 241,063 foot soldiers; and 9,390 trained artillerymen working 5,252 guns; the question might arise as to how the British Government could meet this enormous force if its component parts were to combine against us.

In meeting this question the first point to be remarked is that they never would unite. It was the dream of Madhaji Sindia, the greatest statesman India ever produced, to combine during the last decade of the last century all India against the British. He found the task impossible. Whilst he was maturing matters to this great end one chieftain or other would break away and spoil the scheme by too precipitate action. Sometimes it was Tippu Sahib, sometimes the Peshwa. These gave the English the chance of beating them in detail. Madhaji died just when he had attained the pinnacle of greatness and when it might have been possible for him to put his scheme into action. It was not till seven years after his death that the mind of his successor, Daolat Rao, grasped the value of Madhaji's idea. At that time he and Jaswant Rao Holkar virtually governed Hindustan. Jaswant Rao was as completely penetrated as was Sindia with the conviction that if they did not beat the English the English would obtain supremacy in India. But Jaswant Rao was jealous of Sindia. Though urgently pressed to act, and though promising to act, his jealousy kept him quiet when Sindia battled with the common enemy. He experienced far more pleasure in seeing Sindia defeated than he would have felt in hearing of his victory. But no sooner was Sindia crushed than the dread of the English returned and Holkar precipitated with them a war in which

he was all but annihilated. Now both these chieftains were Marathas. If two princes of the same race, having the same interests to defend, found themselves unable to coalesce against a common enemy, is it probable that princes of different races, divided from each other by religion, by descent, by the memories of past wrongs, could join for the same purpose? It is impossible. I have mentioned but one instance of the action natural to native chiefs; but every period, every age of Indian history teems with similar examples. It was so under the Mogol likewise. The feeling of the native states towards each other is well illustrated by the speech made by Charles II to the Duke of York. "They will never wish me dead to make you King." No single native state would wish the supremacy of England destroyed to bestow that supremacy on another native state. One reason for the general acceptance of the supremacy of England is that that supremacy keeps in check rival native claims.

But, granted that union were possible, what then? There is no answer like a practical answer, and the answer to even a greater difficulty was given in 1857. In that year the fortresses, the arsenals, the magazines in India were wholly or partly garrisoned or guarded by native troops. Two-thirds of the guns were manned by them. The native troops were to the European troops in the proportion of fourteen to one. The bulk of the native troops, men trained by us, armed by us, and able to dispose, to a considerable extent, of our fortresses, our guns, and our magazines, rose in revolt. They had all the advantages arising from a surprise. We were unprepared, yet the handful of Europeans that were on the spot kept them in check till reinforcements could arrive by a long sea route from England.

In the present day we possess arms of precision such as the native princes have not; we guard our fortresses, our magazines, our arsenals with Europeans; we have cannon beside which the cannon of the native princes are exploded weapons; the Suez Canal is available for the transport of our troops. If the trained and disciplined, well-armed and well-provided sepoy failed in 1857, what chance would the combined rabble of the native princes have in 1878? Were they to attempt the chance Assaye and Argaum would be repeated.

But they will not attempt it. Undoubtedly there are men amongst them who have a past and who would chafe under any overlord. But these men feel that some overlordship is necessary for their own security. The present Maharaja of Gwalior had no sympathy with the revolt of 1857, mainly because the sepoy connected that movement with the reassertion of the Mogol dynasty. The triumph of that dynasty would have been no triumph for Sindia. It would have substituted a Mogol overlord for an European overlord—a lawless tyrant for a just and considerate suzerain.

The assertion of the English overlordship by the assumption by Her Majesty of the title of Empress in 1876, was a measure not only politic but imperatively necessary. The more it is brought home to the native princes that England intends to be overlord in name as well as in deed, the greater will be their respect for England—the more solid their conviction that they are not independent but vassal princes.



It was the absence of this direct assumption of overlordship that had encouraged men, disaffected to the English, to rouse in the minds of the native princes aspirations to which they had no claim. It is within my knowledge that the summons to the Durbar, held at Delhi on the 1st January, 1877, caused more than one native prince to communicate his ideas on the subject to another native prince. The result of this intercommunication was a conviction that attendance at that Durbar was imperative.

The proclamation of the title, then, followed by the Durbar, cleared away a delusion which might have been dangerous. The position of the native princes was brought home to each one of them. They all, by their attendance, acknowledged the overlordship of England.

It must tend to the general safety of the country when men in that position are brought to see themselves as others see them, and not with the eyes of their flatterers. The Mutiny, the opening of the Suez Canal, the increasing knowledge of the English language, have made the princes of India more thoroughly acquainted with the power and resources of England than were the wisest of their predecessors. Many of them are now, all of them in time will become, of the same opinion as the late astute ruler of Afghanistan, Dost Mahomed Khan. It happened that during the Mutiny year, 1857, three British officers were at Kandahar on a political mission. Haidar Khan, then Governor of that place, sent word to his father, Dost Mahomed, that news had come from India that all the English there had been murdered: "Had I not better cut the throats of these three?" Dost Mahomed replied: "It is useless; I know these English well. It may be true that all those in India have been murdered, but they will come in thousands from beyond the sea and reconquer the country. Better leave these three alone."

The splendid stand made by England during the last four months against the threatened aggressions of Russia, will go far to impress this idea on the minds of the princes of India, whilst the employment of native troops in Europe will tend to cement together the bonds of the severed branches of the great Aryan race. I have enumerated the strength of the native princes and their powers for aggression; but I am convinced that every succeeding year will increase their loyalty to our Queen and their Empress—their desire to uphold the great Empire of which they form a valuable and necessary part.

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## APPENDIX.

*Showing the War Material at the disposal of the Native Princes of India.*

States.	Guns.	Infantry.	Cavalry.
<b>Rajputana :</b>			
Udaipur .....	538	15,100	6,240
Jaipur .....	312	10,500	3,530
Jodhpur .....	220	4,000	5,600
Bundi .....	68	2,000	200
Kota .....	119	4,600	700
Jhalawar .....	90	3,500	400
Tonk .....	53	2,288	430
Karauli .....	40	3,200	400
Kishugarh .....	35	2,000	150
Dhalpur .....	32	3,650	610
Bharatpur .....	38	8,500	1,460
Alwar .....	351	5,633	2,280
Bikanir .....	53	940	670
Jaisalmir .....	12	400	500
Sirohi .....	—	350	375
Dongarpur .....	4	632	57
Banswara .....	3	500	60
Partabgarh .....	12	950	275
<b>Central India :</b>			
Gwalior .....	210	16,050	6,068
Indor .....	102	5,500	3,000
Bhopal .....	39	4,766	1,194
Dhar .....	4	790	370
Dewas .....	"	"	"
Rewa .....	35	2,000	905
Other States in Bandalkhand ....	421	22,163	2,677
<b>Western India :</b>			
Barodab .....	30	11,000	3,098
Kolhapur .....	258	1,502	154
Kachh .....	38	600	300
Kathiwar .....	508	15,306	3,033
<b>Southern India :</b>			
Haidarabad .....	725	36,890	8,202
Mysore .....	6	1,000	35
Travankur .....	6	1,211	60
Kochin .....	3	300	—
<b>Northern India :</b>			
Cis-Satlaj States .....	141	7,185	3,191
Kashmir .....	96	18,436	1,393
Trans-Satlaj States .....	27	3,275	300
Bhawalpur .....	80	2,484	360
Petty States .....	302	18,000	4,000

The CHAIRMAN : Before proposing a vote of thanks to Colonel Malleon for his very interesting lecture, you will perhaps allow me to make a few remarks, in order to substantiate the statement that he has made, especially with regard to the province of Hyderabad, the most formidable of these native powers. There is no doubt that the natives of the province and city of Hyderabad are among the most warlike, turbulent, and robust men in India, comprising Arabs, Afghans, Pathans, Seedes,

Rohillas, Rajpoots, and other warlike races. With regard to the 725 guns, of which Colonel Malleon has spoken, I had an opportunity of seeing specimens of these guns about the year 1870, when I first reviewed a portion of these troops in the city of Hydrabad. I think I saw somewhere about 18,000 men, and I was shown about 30 guns. Some of them were guns that had done duty at the siege of Seringapatam. I also saw some guns from Golconda which they told me had been brought from Persia in the time of the first Nizam, about the year 1720. There is no doubt the greater portion of the guns are perfectly useless. The Army is entirely undisciplined and unofficered, in the proper sense of the term, except a small force called the reformed army that Salar Jung has placed under the control of European Officers; but really from what I saw of specimens of the 725 guns, I do not believe there is a single one that is of any use, and there were no arms of precision. I will now invite any gentleman to put any questions to Colonel Malleon on this subject, and no doubt he will be very happy to reply to them.

Captain COLLEN, Bengal Staff Corps, Assistant Secretary, Military Department: I have listened with very great attention to the able lecture delivered by Colonel Malleon, and although I had no intention of speaking when I came down, there are one or two points I should like to observe upon. I gather from the lecture that Colonel Malleon believes the armies of the native states of India could not be combined for the purpose of aggression, and I am sure that we must all agree with him in that. But he did not, I think, make sufficient of a point which I would venture to bring to your notice. Many of these native states have, as Colonel Malleon told us, forces of considerable strength; and although not of great warlike power, yet we must admit that though we may term them by the name of "rabble," they are quite sufficient to disturb order in India, if at any juncture of circumstances a portion of the British forces were withdrawn from that Empire. That is a point on which I wish to lay stress. I have only to say, as far as regards the welfare of the native states themselves, that it would be to their great benefit if their forces were reduced to a minimum. They spend a great deal of money on these men, and as Colonel Malleon pointed out, they are of very little use for military purposes. To a certain extent I have always understood, and I have seen portions of most of these forces, they are used as police, and as guards for treasure and so on. Up to that point they are useful, but for military purposes they are quite out of place. They have nobody against whom they could fight except the paramount power, England. My own earnest hope is, and I gather from the newspapers that such a measure is contemplated, that the forces of the native states of India may be reduced to the least possible strength, consistent with our treaty obligations with those states, and with the dignity of those who have been loyal and faithful to us.

Captain WEMYSS: I might mention that the regular horsemen in Barodah were the most active swordsmen I have seen anywhere.

General CAVENAGH: I think we must all fully agree with Colonel Malleon in his remarks as to the inability of the forces of the native states to make any aggressive movement upon the paramount power so long as those forces are without proper leaders. It is, however, a question whether, in the event of our ever allowing native states to take into their service men who would be able to train and discipline their troops against us, they would not in the time of emergency be found a thorn in our side. It is also possibly a question whether we ourselves are wise in training up as leaders, natives who may at any time become hostile to us. In support of what Colonel Malleon has stated with regard to the want of efficient commanders amongst the Marathas at Maharajpur,<sup>1</sup> I may mention an incident that occurred to a man in my own regiment, and although a large body of Maratha cavalry were present, they took no part in the action. The troopers were many of them friends and relatives of the very men we were leading. After the battle, when one of our men met a cousin

<sup>1</sup> Notwithstanding this disadvantage, the Maratha artillery and infantry fought well, and stoutly defended their positions; of the British troops, upon whom the brunt of the action fell, about one in five were rendered *hors de combat*; the regiments that suffered the most were the 39th Foot, 214; 40th Foot, 182; 16th Native Infantry, 180.



of his who belonged to the opposite force, he put the question to him, why, with numbers so much greater than ours, they never charged us? The reply shows conclusively what Colonel Malleon has pointed out, that it is in leaders that the native troops are deficient. The answer was given in the shape of an inquiry: "Where were your European Officers?" Upon which, our man replied: "Our Officers led their troops and squadrons." "Our Officers," the Maratha replied, "were in the rear." As to the power of the troops of the native states to meet British troops in the open field, without leaders, it would be impossible; but I think that the British Government ought not to lose sight of the fact that, considering their large numbers, in the event of any general rising, which of course wise statesmen will always contemplate, for it may occur owing to intrigues that may be carried on against us—these men would act upon our flanks and interfere with our communications; and although they might never be arrayed against us in a pitched battle, they would materially affect our operations, and possibly lead to our suffering serious and great loss.

Mr. HADDAN, C.E.: On the question of the value of Indian irregulars I may perhaps mention one experience I gained in India some seven or eight years ago. During the progress of a railway which was being surveyed in Salar Jung's territory, we were supplied with a guard of so-called grenadiers, which numbered twelve in all, and which mustered about one complete uniform among the number; and when there was a review, I think about two of them could muster boots. The flintlocks were destroyed by time, and they used matchlocks. At the prize meeting, held when our Staff assembled, which was not, however, quite up to Wimbledon, they could not hit a chattee at twenty yards. I happen also to know that Scindia and Holkar, and the princes in general, were very particular about the number of guns that should be fired in their honour at the great Durbar: and Scindia thought he had managed it completely when he was assured of twenty-three, which was rather more than a Royal salute. It was only, however, when 101 were fired for the Kaiser-i-Hind, that he found the real distance which, in our opinion, exists between himself and royalty.

The CHAIRMAN: I think it is my duty now to move a vote of thanks to Colonel Malleon for his very interesting lecture.

Colonel MALLEON: I beg to thank you, Sir, and the ladies and gentlemen present, for the manner in which you have received the lecture which I have given. It has been a great pleasure to me to hear that the remarks which I made regarding the difference between the behaviour of the Marathas at Laswari and at Maharajpur have been confirmed by a gallant Officer who played a very distinguished part in the latter engagement, and who, I think, left his leg on the field. I beg further to remark, that I entirely agree with the gallant Officer who rose first, Captain Collen, in the observations that fell from him regarding the power possessed by the levies of the native troops to annoy us very considerably, in case there should be a disturbance in India. I also entirely agree with him in the hope he expressed, that the levies of those provinces would be reduced from their present extravagant number to one more within compass, so that all danger of any such disturbance on their part should be taken away. I have only to express to the meeting my grateful thanks for the attention with which you have listened to me.

*On 8 July 1878 the Ministry announced  
that five weeks before they had made a  
treaty with the Sultan . . . ceding Cyprus  
to be occupied and administered by Great  
Britain.*

## LECTURE.

*E. W. H.*

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Friday, June 14th, 1878.

Colonel H. YULE, C.B., R.E., &c., &c., in the Chair.

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### ON COMMUNICATIONS WITH BRITISH INDIA UNDER POSSIBLE CONTINGENCIES.

By Major-General Sir FREDERIC J. GOLDSMID, C.B., K.C.S.I.

THERE can be no doubt that the possession of so vast a territory as British India brings with it many serious responsibilities. Among the more recent illustrations of this truth is the mode in which Government has dealt with the famine. It has administered to the wants of the hungry in the far East as it would have done at home; it has acknowledged the principle that a sovereign rule must be a paternal rule; that starving subjects must be fed as well as starving children; and that without distinction of distance, colour, or creed. We do not say that nothing is received in return for this expensive fulfilment of sympathetic duties. If England had only, on the credit side, a large field of honourable employment for her sons, and the *prestige* of a vast empire, it would be much; but she has these and more: she has an Asiatic army, to appear at a sudden call in this as well as any other quarter of the globe; thousands of Oriental soldiers to rise up and do her work in the West, should their presence be required on an emergency.

But one of our main responsibilities is that of communication. England must not only have a link with India by telegraph; she must also be always able to reach her practically and in substance, and the long sea route is out of the question in these days of rapidity of movement, when action is worthless unless it is independent of time, when practice treads on the heels of theory, and when execution almost overtakes design. To see how this is to be attained under all circumstances, independently of a long sea route, is then the object proposed in the present paper. In order to steer clear as much as possible of shoals in the shape of politics, I will, in the first instance, talk of countries and people as though we were on the best of terms with all; as if they were at our disposal to traverse and re-traverse with the same facility as we draw lines on the mute map before us; as if all we had to contend with

were physical difficulties and commercial considerations. I would ask leave, however, to include in the term "physical" the obstructiveness of robbers or of lawless tribes.

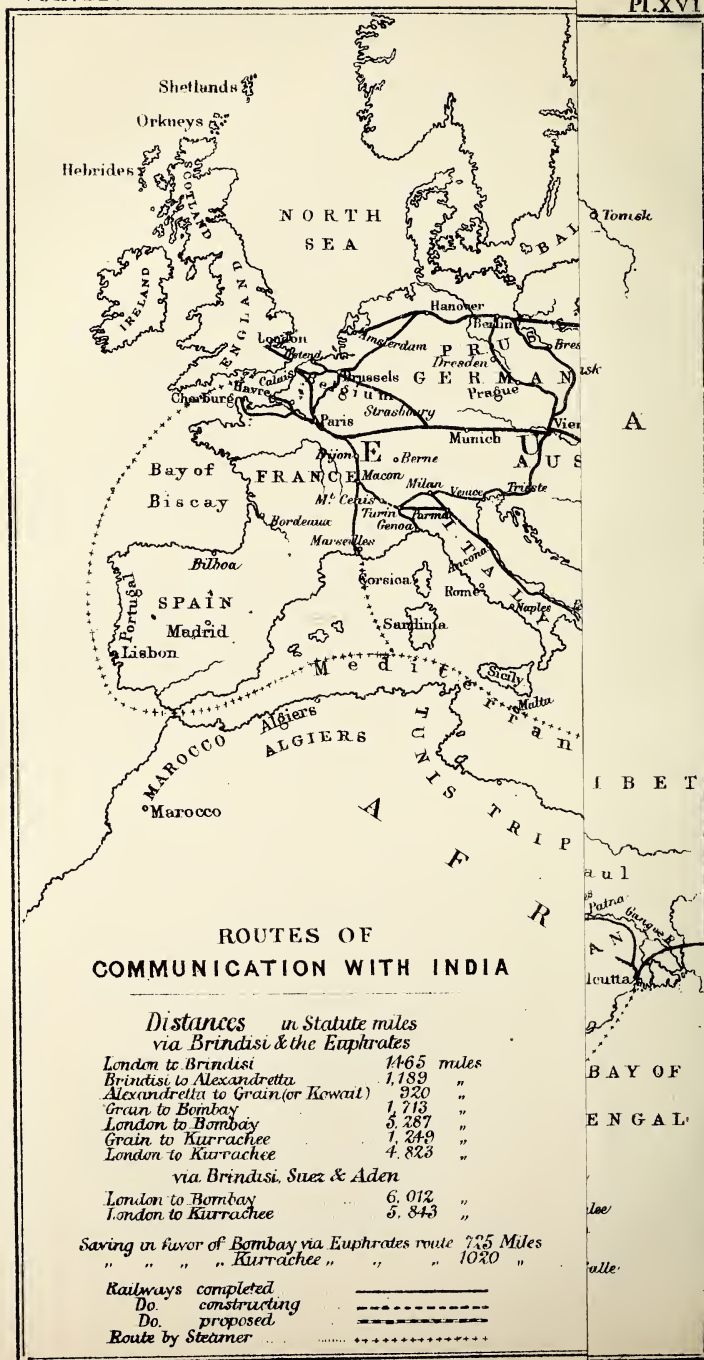
Nearly three years ago I had the honour of delivering a lecture in these rooms "On certain Roads between Turkistan and India, independent of the Oxus or of any Oxus Boundary." The two roads then described were supposed to connect the seaboard of Northern Persia with the Lower Indus, but the distances were great. The one from Enzeli, in the south-west corner of the Caspian, passing through Eastern Persia, Western Baluchistan, and Eastern Makran, was estimated at 1,870 miles; the other, from Bandar-i-gez, on the south-eastern shores of the Caspian, passing through Northern and Eastern Persia and Afghanistan, was reckoned 150 miles longer. We might possibly, as I represented at the time, reduce the two lines to much the same figure, *i.e.*, a maximum of 1,800, or a minimum of 1,500 miles. But then the Caspian is at an immense distance from England, and these roads, however important for an invading army, are not to be thought of as a means of passing British troops to and fro between Europe and Asia. In fact, I may state at once a proposition, the soundness of which should, without demonstration, be apparent to all present, that anything like complete overland communication of such a nature, if to be considered at all, must be considered as practicable by railway. How India is to be reached by this means is what we have now to examine, and in doing so I am quite aware that we shall tread upon somewhat debateable ground.

In the first place, unless the British Channel were bridged over or tunnelled under, we must use transports for crossing it; and the embarkation of troops at all would involve much trouble, provision, and expense; so much so, indeed, that the loss of a few days in a preliminary sea voyage might be found expedient, and the land-starting-point fixed in the Mediterranean, instead of a French or Belgian port. But in order to get some practical acquaintance with our proposed lines, whether in Europe or Asia, let us glance at what has been done in this respect by the telegraph.

Twenty years ago the revolt in India had been barely suppressed; there was no such institution as a telegraph to India, or even half-way to India, though the Red Sea cable may have been under preparation for laying and collapsing, and the Government were seeking, more or less in the dark, the means of meeting a requirement which events had shown to be most urgent. Ten years later, the failure of the first Red Sea cable had been nigh forgotten; the Government Officers had carried a cable from Karachi to Bushahr and the head of the Persian Gulf, had constructed land lines in Persia and Makran; and measures were being taken to secure safe and rapid communication with the cables through Europe and Asiatic Turkey on one side, and Europe and Persia on the other—amid loud cries, be it said, of dissatisfaction at the time occupied in perfecting so delicate and intricate a process. To-day there is a Red Sea cable and a land telegraph communicating with the Government cables, the successful working of which may be certified by the conclusive and convincing evidence of the daily press. As the



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first-named line indicates our usual overland Indian route *viâ* Suez, I pass it by and speak of the other.

In 1868 we had made arrangements for as many as eight lines of communication towards India through the continent of Europe; five were *viâ* Turkey, and three *viâ* Russia. Of the first, that bearing more directly on Constantinople is through Brussels, Stuttgart, and Vienna, while the next most direct is perhaps by Paris and Munich. The sea passage from the Italian to the Albanian coast is naturally fatal to a continuous overland line through France and Italy. I do not think it would be profitable to discuss which route of these, or which route independent of these, should be selected for an Anglo-Indian locomotive; but the fact that there were ten years ago five acknowledged main lines of telegraph between London and Constantinople, and that these lines might be subdivided into numerous branch and subsidiary lines, may help us to determine how far the completion of present projects to connect the city of the Sultan with the capitals of Western Europe would suit our purpose in providing one grand line of railway communication with British India. The three telegraph lines through Russia may now be looked upon as merged in the Siemens line, which, starting from London, passes through Lowestoft and Emden, Berlin, Warsaw, Odessa, Kertch, and Tabriz to Tehran, where it is taken up by the Government wires, and its messages are transmitted to Bushahr and Karachi. But the chances of a completed railway to Tehran are hardly equal to those of one to Constantinople, and a "concession" would not break ground so freely on the shores of the Caspian as on those of the Mediterranean. As regards Baron de Reuter's proposed line or lines, I am unable to speak of the present state or prospects from any personal acquaintance with details. The silence of the press for so long a period tends to the supposition that the question has been adjourned *sine die*, and probably such is the reality. It is not unlikely that the approaching revisit of the Persian monarch may give rise to renewed talk on the subject, but it would be premature to anticipate the result of a hypothesis.

It may be truly said that a telegraph line is carried over tracts which do not admit so easily the fixation of rails and sleepers or the passage of a locomotive. But, except for protective purposes, posts and wires are not usually brought into difficult places where these can conveniently be avoided—and even where skill, energy, and determination make light of physical obstacles at the onset, it must be remembered that it is not the mere laying down a telegraph line which has to be considered, but also its maintenance and possible repair in after years. Those whose duty it is to keep in order a great work or public building are not always (perhaps it would be more true to say are seldom) imbued with the spirit of the designer or architect; to use a more familiar comparison, the nurse or governess does not care for the child with the affection of the mother. In the case under consideration we must have something which can readily be got at by ordinary guardians, in all weathers, and on all occasions of break or emergency. Therefore, in countries like Persia and Asia Minor, where the mountains are lofty and continuous, and where roads and passes may be





Note. The Proposed Route is shown in Red.

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found impracticable to bipeds as to quadrupeds; or, like Mesopotamia and Turkish Arabia, where broad rivers have to be spanned, with much cost and care, and floods avoided or provided against with a skill dependent on local experience, the direction followed by lines of telegraph is important to the due selection of a line of rail. Besides, independently of engineering considerations, there is the same necessity, in both operations contemplated, to deal with the people of the country, whether civilized or half civilized, or sheer robbers and savages. The Bakhtiari of Persia, who will purloin a few yards of wire, or the Kurd of the Turco-Persian frontier, who will make the insulator a mark for his matchlock, may find an object of equal solicitude in the wood and iron of railway contractors, to say nothing of a general love of disorder, and dislike to authorities and regulations.

Not very long ago, M. Ferdinand de Lesseps proposed to take a railway line from Orenburg to Samarkand, and from Samarkand to Peshawar. The distance had been reckoned at some 2,400 miles, and the difficulties to be surmounted will be understood by the fact that the passage of the Hindoo Kush was part of the programme. There was to be—I quote from an article in a daily paper describing the scheme when first made public—"an unbroken iron road, 7,500 miles long, by which, with express trains travelling at 35 miles per hour, the entire journey from Calais to the City of Palaces might be accomplished in "eight days."<sup>1</sup> There are many reasons for rejecting or indefinitely postponing consideration of such a project in England. It is very true that the Russian has proved the best land route for our Indian telegraph; but, with telegraph wires, distances are not so important as with railways, and, in the former case, the alternative of a Mediterranean and Red Sea line has been a sufficient guarantee for the preservation of communication, until a through railway arise to supply a new line of telegraph also. I am quite sure that the inventive genius and enterprise of M. de Lesseps could speedily put before us a more tempting proposal than this, and one more likely to carry the popular sympathy and open the pockets of shareholders; but I will speak of it by and by, with others which come into the same category. Looking further back still, I find, more than five years ago—when the distinguished Russian nobleman whose recent movements between London and St. Petersburg have been so carefully watched and chronicled, was performing the same journey to and fro, with strangely similar intent and under strangely similar circumstances (though in connection with Khaiva rather than Stamboul)—a letter appeared in the *Times*, the subject of which is important to our enquiry. It was then stated that, in the archives of the *Ministre des Voies et Communications* at St. Petersburg, was a plan which had been provisionally submitted to the Imperial Government, for the construction of a railway commencing at Syd Folden Fjord, in Norway, in 67° 31' lat. north, and 15° 39' long. east of Greenwich, passing by Gellivare to Türtüla, Onega, Solikamsk, Kotschaisk, Tobolsk, Irkutsk, Mamatchin, Pekin,

<sup>1</sup> I make it rather nine days; and what would be the condition of troops or individual travellers after nine days and nights uninterrupted journeying at the rate of 840 miles in the twenty-four hours?



Tientsin, to the seaboard in the Gulf of Pe-chili. From Tobolsk a line would run to Pesháwar, which is only some three-quarters of a degree more to the eastward, though very far removed in latitude; whence, to Calcutta and Bombay, respectively, the conveyance of the traveller may be already considered *un fait accompli*, though both lines are carefully particularised in the scheme. The writer of the letter under reference had been for many years Russian Vice-Consul at Shields, and having himself visited a not unimportant part of the route, was able to advance his own opinion that there was no technical hindrance to the execution of the undertaking. I am not aware that any attention was given to his remarkable statement at the time that it appeared, but it was not improbably thought more visionary than practical by the majority of those who perused it. As we are now, however, endeavouring to take in all possible ways and means of communication with India, it may be well to revert to the very words of the Vice-Consul on that occasion. He says:—"Specially constructed steamers will convey goods and passengers to and from the Norwegian coast and the United Kingdom. The gravitation system, *per se*, no novelty and infinitely less costly of construction and working than any other, is proposed to be applied to this gigantic undertaking, dispensing with the locomotive or standing engine power, the latter only exceptionally resorted to. Deep research and the most rigorous calculation show that the entire import of tea from China, of sugar, rice, and general produce from the East Indies, &c., can be effected by the proposed routes much more expeditiously and considerably under the cost by marine transport *via* Suez or the Cape, and *vice versâ*. European exports will follow this route. Naturally passengers will prefer land to a lengthened sea conveyance." It may be added that the writer was the reverse of an anti-Russian; he considered that the extension of Russian influence in Asia was all to the advantage of England; he was the strong advocate of an alliance between the two nations, illustrating his arguments by the assertion that Russia supplies us with more cereals than any other country, and that the increase in grain importations to our shores in 1872, and since the later development of Russian railway traffic, was to our incalculable benefit.

About ten days after date of the letter to which I have just referred, the Berlin correspondent of the *Times* extracted from the *Allgemeine Zeitung* the memorandum on an invasion of India which had been presented to the Emperor by General Duhamel at the time of the Crimean War. The details were prefaced by a statement that, according to history, nearly all the conquerors of India came from Central Asia and Persia; that the roads chosen for the purpose by Alexander, Chenghiz, Taimúr, Baber and Nadir were still available or open; and that all these roads, whether from Persia or the Oxus, converged upon Khurasan and Afghanistan. Five lines of march were then designated to Kabul, as follows: 1. From Orenburg, by the Ust-Urt, Khaiva, Marv and Bukhara; 2. From Orsk or Orenburg by Aralsk, Bukhara, Khulm and Bamian; 3. From Orsk or Troitsk, by Aralsk, Ak Masjid, Tashkand, Khokand, Khulm and Bamian; 4. From Astra-

khan by sea to Astrabad, thence by Kadushan<sup>1</sup> or Shamid, Mashhad, Herat and Kandahar; 5. From Julfa on the Russo-Persian frontier by Tabriz, Tehran, Mashhad, Herat and Kandahar. Why the two last should be diverted to Kabul at all is not shown, because from Kandahar there is given the direct route to India by Kwetta, Dadar and Shikarpur; as from Kabul by Jalalabad, Peshawar and Atak (called the best, shortest, and healthiest road); and from Ghazni by Derah Ismâil Khan. I quote this project as indicative of lines of communication useful to be borne in mind, rather than with any intent of provoking discussion on the feasibility of a scheme which, so far as disclosed to the outer world, is almost ludicrously deficient in detail. But it should be observed that the Russian project does not ignore entry into India other than by the Khaibar and Bolan Passes; and there is little doubt but that invaders of India from Alexander to Mahmûd of Ghazni, and again from the ninth century downwards, did make use of other routes for purposes of entrance or exit, or both.

Later still than the reference to General Duhamel's plan of invasion to which I have alluded, a short but significant letter appeared in the *Times* on the subject of roads to India which seems to me to merit particular notice. It called attention to the fact that Persia and Afghanistan are not the only ante-chambers as it were to the Indian palace of attraction; and recalled the circumstance that a Chinese and Tibétan army, fully equipped, crossed the Himalayan mountains into Nepal at the beginning of this century and, after penetrating to the valley of Nawakot, sixteen miles only from Kathmandu, the capital of Nepal, dictated a humiliating treaty to the ruling Gurkhas. The writer then proceeded to show how dangerous to India would be the appearance of an invading force in Nepal, "overhanging, as it does, 500 miles of an open frontier in the very centre of the Gangetic valley." This Chinese invasion of a country then recently conquered by the Gorkhalis, or, as we call them, Gurkhas, a brave and warlike people, is certainly remarkable; and we know that the latter were utterly defeated. A late history of Nepal, translated into English from the original, mentions the arrival of the large army despatched from China; but asserts that it was cut to pieces by one of their own illustrious commanders, who obtained great glory from the exploit; explaining how "afterwards the Chinese Emperor, thinking it better to live in friendship with the Gorkhalis, made peace with them."

But this is on a par with Oriental history in general. For instance, in the narrative to which I have just referred, the English war with Nepal, which begun in 1814, and ended about eighteen months later, with the gain to us of a considerable tract of territory, is dismissed in about four lines. We are told that "it broke out in the Terai, but depriving them (the British) of wisdom, the Raja saved his country. Then calling the British gentlemen, he made peace with them, and allowed them to live near Thambahil."<sup>2</sup>

<sup>1</sup> Kabushan: but here probably Kuchan or Shahrud, *i.e.*, the upper or lower road to Mashhad.

<sup>2</sup> History of Nepal, translated from the Parbatiya. Cambridge University Press, 1877.

We have now glanced at a number of routes which, for the traveller starting from England, necessitate an immediate and in some cases a prolonged movement to the east; the more southern course, or descent upon India, being at a comparatively late stage of the journey. It might be enquired into with advantage which of these are the more practicable for the locomotive and the rail; but I think it more profitable in a brief paper of this kind, and especially with imperfect data, to mass them in a general consideration. My own impression is that a railway to India commencing in Norway, with its northern terminus at the Syd Fiord, a grand junction at Tobolsk or Tomsk—roughly assumed as geographically convenient—and a southern terminus at Calcutta, would offer to us in some respects as great advantages as any other; and I believe that, in spite of apparent physical difficulty, a feasible road somewhere in that direction might be discovered or worked out, notwithstanding the Hindu Kush and Himalayas. But we are yet in the dark about even the preliminaries to such an undertaking rightly called “gigantic;” and this is hardly the convenient season for seeking enlightenment. I therefore propose to leave these routes to men who, like M. de Lesseps, if they do hit upon a sound and practicable project, are not likely to abandon it until success crowns their endeavours; and to ask you to think over with me something of which you may have heard before, though not perhaps in minute detail. Instead of the direct and immediate movement from England eastward, I propose to take ship, or ship and railway to Turkey. How Constantinople and the Asiatic shores of the Bosphorus are to be reached will depend upon the result of a great question at this moment under deliberation and agitating the minds of statesmen as well as obscure individuals. Let us suppose ourselves at some particular spot in the Mediterranean always available, and so situated as to place us within easy reach of the Syrian coast, or a convenient starting-point for a railway to the Persian Gulf. As an island wears an independent look, we may choose Cyprus.

I should be very glad to say what I have to say in a few words without being wearisome; but the description of places and statistics are more essential than interesting in a paper like the present. By drawing upon foreign sources, however, as well as English handbooks and English authors, I shall run less risk of repeating facts well known to my hearers, and I venture to hope the published record will be found useful, even if the spoken matter be tedious.

The geographical position of Cyprus would make it a fitting guardian of Upper Syria, Cæle-Syria, and almost of Palestine, if the island were under enlightened Government. We are told that it measures 140 miles in length from east to west, and has an area of 3,000 square miles; that two ranges of mountains stretch respectively along its northern and southern coasts; and that a fertile plain lies between them. It is said to be the Chittim of Scripture, and of the Phenicians as well as of the Hebrews; a name found in the Latin *Citium*—its chief town in the time of Cimon the Athenian, who died while besieging it in the fifth century before the Christian era. To the classical and mythological age, it was the birthplace of Venus; accord-



ing to Pliny, the seat of nine kings; in ancient history, at one time under Egyptian dominion, then Persian, then Greek, and finally Roman. In more modern days it fell into the hands of the Byzantine Greeks, and afterwards of the Saracens, from whom it was taken by Richard of England during the wars of the Crusades, to be bestowed upon Guy de Lusignan, titular King of Jerusalem. There were sixteen princes (and one princess) of the Lusignan family, who ruled in Cyprus, on the death of the last of whom, James the Third, the Venetians took possession. The latter again were dispossessed by the Turks under Sultan Selim the Second in 1570-71; and these have held the island ever since, inclusive of a ten years' interval when sovereignty was exercised by Muhammad Ali, Pasha of Egypt. On the east, according to Pliny, it once joined the continent near Syria: to the north the average breadth of the channel which separates it from Asia Minor, once the "Aulōn Cilicius," or Cilician Strait, is probably not 100 miles. The present condition of Cyprus is not hopeful; its population is said to be less than a twelfth part of the number estimated under the Venetians, or some three centuries ago; and the majority are Greeks. Its resources have, it is to be feared, greatly diminished since the Ottoman conquest; and its rich soil remains for the most part untilled and unprofitable; its forests have become less and less rich with trees; and though it can produce silks and cereals, wool, cotton, and other of the more valuable articles of commerce, and keep up an export trade with England and France, Egypt and Turkish ports, a fifth of the island only is said to be under cultivation. As for public works, the roads of the Romans and Venetians have become long since obliterated; the bridges have fallen to pieces, and goods are conveyed in miserable carts, and over almost impracticable tracks. The last Consular Report from Larnaca, dated 31st January, 1877, states:—No public works have been undertaken, and the want of bridges, roads, and jetties is becoming seriously felt. The firman which was read here about the new reforms, soon after the accession of Sultan Murad, remains a dead letter, and but little hope is placed in the working of the Constitution. The local tribunals still refuse to admit Christian evidence in cases in which Mussulmans are concerned. The vexations of the Zaptiehs in the villages for the exaction of taxes have not at all ceased, and little protection is secured to the inhabitants of the rural districts.

Cyprus is, or was recently, divided into four departments, of which three may be specially noted: on the south, Larnaca; on the east, Famagusta; and on the west, Baffa. The seaport bearing the name of the first of these is the ancient Citium: to this may be added Limasol, the great wine centre, a town of 7,000 inhabitants. I have no very full statistics of the port of Larnaca, but fifteen years ago it received 324 vessels of 54,340 tons, and sent out 321 vessels of 53,458 tons. In 1876 there were entered 457, and cleared 483 vessels of 92,926 and 91,690 tons respectively. At Limasol, in 1863, 493 vessels were entered of 32,980 tons.

Famagusta, an offshoot, if not a relic of the memorable Salamis, looks upon the Syrian coast between Latakia and Tripoli, and though

ruined and neglected, might be made, I understand, one of the best ports in the Mediterranean. It was here that the gallant Venetian Bragadino, after a defence famous in history, surrendered to the Turkish commander; and where, tradition has it, the fleet containing the choicest spoil of the island was destroyed by the act of a female captive, who found means to set fire to the vessel, on board of which, she was kept a prisoner.

The superficial extent of the present harbour is reckoned at 32 hectares (nearly 80 acres), to which a depth of 10 metres (about 33 feet or  $5\frac{1}{2}$  fathoms), might readily be given; but there is only a space of 2 hectares (nearly 5 acres), which can be relied upon for the actual reception of ships. M. Collas, a French writer, experienced in Turkey and the Turks, thinks that, with ordinary engineering skill, a harbour might be formed here, covering a space of more than 60 hectares (148 acres). The plains of Famagusta and Messanieh, as well as those of Larnaca, are famed for cotton. Water is sufficient in the first. Messanieh can boast an extent of nearly half a million acres, of which perhaps not 100,000 are under cultivation. A little attention to well-irrigation would make it very productive. Baffa is the classical Paphos, celebrated for the worship of Venus, and claiming an origin from the fall of Troy. It is the chief emporium of silk in the island. This trade has, however, greatly deteriorated, and in no way represents its normal or possible condition. So with the cotton, the best and dearest in the Levant. From the 30,000 bales exported under the Venetian Government, there has been a reduction to 3,000. M. Collas thinks that the opening and ameliorating of the port of Famagusta would give an immense impetus to the export of cotton, which might be grown up to the amount of 25 to 30 millions of kilogrammes, or not far short of 30,000 tons, a high figure of productiveness.

The administrative capital Nicosia, or Lefkosia, is in the interior; but notwithstanding its old repute and prosperity under the Venetians, it has become in later years rather a centre of shops than of merchandise: that is, merchants are not resident there; for all trade is carried on through Larnaca. As to Celigne, which M. Collas makes the fourth department of the island, it should be in the north,<sup>1</sup> though the name is not very clearly shown in modern maps. I would add, with respect to this large and beautiful but sadly neglected Cyprus, that, independently of its magnificent position in reference to the Syrian coast, it is rich in natural resources, in agricultural products, and in classical and historical associations. Its name, and interesting particulars regarding its geography and history will be found in innumerable books, from the earliest ages of book-making to the present time. The ponderous old volumes of the 17th century, such as those of Sir Walter Raleigh, of Peter Heulin, and of Purchas have all something to say about it. And it will not be forgotten that St. Paul and St. Barnabas sailed from Seleucia on the Orontes to Cyprus, in the first century of our era.

I do not see that it is exactly talking politics to say that Cyprus in

<sup>1</sup> The Italian "Cerina," ancient Ceryneia, with a small bad harbour.

the hands of Great Britain would be an invaluable acquisition, and worth any amount of land which might be purchased on the coast to its east. The distance to the several ports on the mainland is not great: indeed, the island is said to be visible on a clear day from Selencia. A railway terminus for the Persian-Gulf-line might be reached in a very few hours, and fair-weather boats calculated to carry over a thousand passengers—troops or civilians—might be used at certain times at an inconsiderable cost. But let us now pause to consider which of the many lines proposed should be chosen for the railway.

Of the routes discussed before the Committee which sat on the Euphrates Valley Railway in 1872, five were selected as the most important, they were:—

1st. A line starting from Alexandretta or Suedia, near the mouth of the Orontes, passing through Aleppo to the Euphrates, at or near Jabah Castle, and thence carried down the right bank of the river to Kuwait, on the western side of the Persian Gulf.

2nd. A line starting from one of the same points, crossing the Euphrates at Belis, passing down the left bank of the river, or the right bank of the Tigris, to a point nearly opposite Baghdad, re-crossing the Euphrates, and proceeding to Kuwait.

3rd. A line starting as before, crossing the Euphrates at Bir, thence going round to Orfah and Diarbekir, and following the right bank of the Tigris as the last.

4th. A similar line, only following the left bank of the Tigris.

5th. A line starting from Tripoli, and proceeding across the desert, by way of Damascus and Palmyra, to the Euphrates, whence it might follow one of the preceding routes.

Since the date of the Committee's report, the late Mr. W. A. Brooks, a member of the Institution of Civil Engineers, proposed a line of railway starting from the island of Ruad, crossing the Orontes near the town of Homs, passing through Palmyra and the confines of the Syrian desert, and finding its way to Kuwait in the Persian Gulf by the right bank of the Euphrates.

It will be observed that here are six projects, but that the first four have the same doubtful starting-point—Alexandretta or Suedia. Of the remaining two, the one begins its course at Tripoli, the other at Ruad, between which places there is a distance of, it may be, half a degree by sea, and something more by land. To me it does not seem material whether we take the one or the other of the six routes, so far as the main object is concerned—or simply to effect railway communication. I believe that, in this respect, the end could be achieved by British energy and engineering in any case. But I do think it important to consider the question of distance; and sanitary precautions are perhaps quite as essential to success as the choice of a line practicable to engineers. The possession of Cyprus would facilitate selection of a terminus; for with such resources as are there available we could only require on the mainland a landing-place, offices, sheds for temporary accommodation of troops, and residence for a small railway staff provided from head-quarters in the island. Without presuming



to set aside the many arguments put forward on behalf of other localities, I at once declare myself in favour of commencing work at Tripoli or Tyre; otherwise of reviving the suggestions of Captain Burton—certainly not the least competent judge among the score and a half of competent witnesses examined by the Select Committee on the Euphrates Valley Railway.

Now, if we are going to run a line through the so-called Syrian desert, we cannot well avoid Palmyra, and here we reach at once a main station in an old acknowledged line of communication between east and west. Whether it was included in the great road passing from Tangiers to India and China I feel uncertain; because the mention of Kufa, between Damascus and Baghdad, as one of the halting-places, leads to the influence of a lower route; but I daresay that it was, and I shall revert to this long line of traffic by and by as having a direct bearing on the subject of present discussion. In any case let us not suppose that in penetrating this resort of Bedouins we have advanced into an unknown region. To the best of my belief I have myself met with more than one European who has accomplished the journey across it when passing from Baghdad to Bairut; and I cannot but wonder that no such experienced traveller was examined before the Select Committee. For about 600 years Palmyra shared more or less with Alexandria the proud distinction of being an acknowledged centre of western traffic with the east. If it be the Tadmor of King Solomon, as generally supposed, it had at the dawn of that period already existed for six and a half centuries. From 331 years before the Christian era, when the Persians succumbed to the Greeks, to A.D. 275, when Zenobia was defeated by Aurelian, Palmyra was a noted city to traders from the Persian Gulf as from the Mediterranean—brought eventually into the Roman commercial system under the Emperors Trajan and Adrian. As it was not, however, a port, it doubtless received its Indian goods through the medium of Arabs. Mr. Priaulx, in his “Travels of Apollonius of Tyana,” speaks of it as “pre-eminently an inland town,” and “situated in the desert some eighty miles from the Euphrates.” He does not think that it could have had any direct intercourse with India:—“Its citizens and resident strangers were merchants, warehousemen, carriers, agents, but they assuredly were not seafaring men; they possessed no ships, and received the produce of India through the Arabs, whose vessels delivered it at Sura or Thapsacus on the Euphrates, whence it was brought on camels to Palmyra.” The two cities named appear to me to represent, one a point high on the river near Mr. Andrew’s Jabah Castle or Belis, and the other a point low down towards the site of ancient Babylon. But Mr. Priaulx also says that, if the Arab or other vessels bringing the produce of India up the Persian Gulf did not themselves ascend the Euphrates, “at Teredon they discharged their cargoes intended for Vologesia, which was reached either by land on camels, or in vessels of lighter draught by the river.” The time taken up in the journey he is unable to conjecture; but he puts the distance at nearly 250 miles. “At Vologesia,” he writes, “a two days’ journey from their

"city, the merchants of Palmyra took up the trade. In its market or fair, held always at some little distance from the town itself, they met the Arab and Indian traders, and exchanged with them by sale and purchase the manufactures of the west for the goods and produce of India." Now in "Peter Heulin," an edition of 1652, I find that Balsora (our Basrah), the port town to Babylon, is supposed to be the city of Teredon, mentioned by Ptolemy; and that Volagesia is placed by Ptolemy among the cities of Chaldea, but by Marcellinus in Assyria. Kiepert's, "Imperium Romanum" map shows it to be in the former locality and near Babylon; but by the two days' distance from Palmyra, Mr. Priaulx must evidently suppose it higher up the river. It has been a learned question whether certain ambassadors coming from India to Augustus passed through Palmyra; and the argument used against the likelihood of the route was the statement that owing to the length of the journey several of the dignitaries died on the road—a circumstance which was hardly credible for so short a journey, and so direct a route.

Captain Burton gives the direction and distance of two routes to Palmyra from his own knowledge; that is to say from his own knowledge, inasmuch as he had been to Palmyra—though he was not asked the important question by what route he had gone or returned. Than this renowned city no place seems more fitting to be a station on the line of railway from the Mediterranean to the Persian Gulf. It is only 144 direct geographical miles from Tyre, or 158 from Tripoli, and "is in the first overland route which was made to the Euphrates; it is as old as the days of David and Solomon."<sup>1</sup>

Perhaps the main objection to Captain Burton's proposal in favour of Tripoli is contained in the answer of Captain Felix Jones to the questions put to him in a second recall before the Committee. "Tripoli," he states, "is no port, and is as hot and unsalubrious as Alexandretta itself. Secondly, between it and Palmyra the double ranges of mountains, Lebanon and anti-Lebanon, offer obstacles no less formidable to surmount with rails than the passage of the Bolan Pass; thirdly, the route is both indirect and more distant from all *points d'appui*; it is more in the true desert, and therefore more liable to greater risks."<sup>2</sup> But the risks are afterwards explained away as comparative, and the climate of Alexandretta is admitted to be "a little more unhealthy than the others." Whereas, on the physical difficulties of the Lebanon and Anti-Lebanon, I turn to the pamphlet which Mr. Brooks published under the title of "Euphrates: the Road to the East." This gentleman says, "The line of railway proposed by me from the Syrian shore, abreast of the island of Aradus (Ruad) to the Bay of Kuwait in the Persian Gulf, will have a length of only 850 miles, and will certainly be 100 miles shorter than from any other proposed western port except that of Tripoli;" regarding which, he adds, a few pages further on: "Though I might damage this rival scheme by referring, as others have done, solely to the great altitude

<sup>1</sup> Parliamentary Report on Euphrates Valley Railway, pp. 130–135.

<sup>2</sup> *Ibid.*, p. 151.

“ of the Lebanon range in the neighbourhood, I think it fairer to  
 “ at once acknowledge that, although at a greater cost, the same pass  
 “ through the mountains, which I have availed myself of for the road  
 “ from Aradus, is apparently also quite accessible from Tripoli, and,  
 “ therefore Aradus and Tripoli stand upon their own competitive  
 “ advantages as harbour or naval stations.” The pass mentioned is  
 that called *Wádi Khálid*, and it seems to me therefore that if a land-  
 ing-place were available between Aradus and Tripoli, that would be  
 the best and most convenient point for a railway terminus. Fama-  
 gusta would be the opposite port in the island of Cyprus, although  
 Larnaca, if preferred, would doubtless answer equally well as regards  
 geographical position. If there be no intermediate spot suitable to the  
 purpose, then let those acquainted with the localities choose between  
 Ruad and Tripoli; but there would be no need of preparation at either  
 for the shelter of line-of-battle ships, as readily provided by the  
 natural advantages of Ruad.

I shall presently have to make one short quotation from the  
 Report of the Select Committee to show the favourable opinion  
 entertained of the Euphrates Valley Railway in respect of British  
 interests. It is perhaps only fair to repeat the passages by which  
 that opinion is immediately preceded:—

“ The principal argument in favour of Alexandretta is, that it  
 “ possesses a fine natural harbour. The objections taken to it are—  
 “ first, that it is an unhealthy place; and, secondly, that a railway  
 “ starting from it would have to be carried across more difficult country  
 “ than would be encountered on a line from Suedia up the valley of  
 “ the Orontes. Suedia, it is said, is far more healthy than Alexan-  
 “ dretta; but, on the other hand, there is no port there, and should it  
 “ be chosen as the terminus, great expense must be incurred in making  
 “ one. The advocates of Alexandretta contend that its unhealthiness,  
 “ even at present, is much exaggerated; and, further, that a much less  
 “ expenditure than would be required to make a port of Suedia would  
 “ be sufficient to drain the marshes, which are the principal cause of  
 “ the insalubrity of Alexandretta. It has also been shown by recent  
 “ engineering evidence that there would be no difficulty which could  
 “ not be readily overcome in the line between Alexandretta and Aleppo,  
 “ and that it would be even preferable to the line of the Orontes. Your  
 “ Committee have not the means of forming a decided judgment on  
 “ these controverted points, and are of opinion that should a railway be  
 “ undertaken, it would be desirable that the relative advantages of  
 “ these two Mediterranean termini should be carefully investigated by  
 “ a competent commission.

“ With regard to the third port which has been mentioned, namely,  
 “ Tripoli, your Committee would refer to the evidence given in its  
 “ favour by Captain Burton, which is not, however, supported by that  
 “ of the other witnesses whom they have examined. So far as the  
 “ information they have obtained goes, they are disposed to prefer  
 “ Alexandretta to Tripoli as the point of departure, even for a line  
 “ down the right bank of the Euphrates; while, should a line down  
 “ the Tigris be preferred, or should it be thought desirable to connect



“ the new line with the projected Turkish system, there can be no doubt of the superiority of the former terminus.

“ As regards the terminus on the Persian Gulf, your Committee are decidedly of opinion that it would be better to carry the line to some point where it might be brought into communication with the steam vessels which are now under Government subvention to carry the mails, and which ply from the Indian ports to Bussorah, than to continue it along the coast to Kurrachee, by a very expensive and probably unremunerative route. Of the particular ports which have been mentioned, they are inclined to prefer the port of Grane; but upon this point, as well as upon the selection of a port on the Mediterranean, they think that a local inquiry, conducted by competent scientific authorities, with a special reference to the purpose in view, would be desirable.

“ Passing from the question of the termini to that of the route itself, your Committee find that the arguments in favour of, and against, the Euphrates and the Tigris routes respectively, may be thus stated :—

“ The Euphrates route is considerably the shorter, would be the cheaper to make; and, assuming an equal rate of speed, would afford the quicker passage for persons, troops, or mails passing between England and India. The Tigris route might attract the larger amount of traffic, and would connect itself better with the projected Turkish system.”

It will be observed that in selecting Tripoli for the point of departure, I am only differing from the Committee in a *disposition* to prefer Alexandretta, so far as the information they had obtained enabled them then to form an opinion. In carrying on this preliminary line to Kuwait, I am strictly following the course they were inclined to prefer; and in pronouncing in favour of the Euphrates route, I am advocating that which they have stated to be the shorter, cheaper, and more expeditious. Mr. Brooks has strengthened the case in favour of Tripoli, by the additional evidence of his pamphlet, published since the sitting of the Select Committee, because his proposal to select Ruad as a railway terminus on the shores of the Mediterranean, is tantamount to an approval of the desert line from Tripoli.

Fully persuaded then that there is no valid objection, moral or physical, to the construction of a line of railway through the Palmyra desert to a convenient point on the Euphrates, and thence to the Persian Gulf; and believing that the said line has been sufficiently studied in practice to make the only material subject of deliberation its Mediterranean terminus, I will put as a not absurd hypothesis, that we inaugurate our operations for urgent overland communication with India by establishing a depôt, for men and materials both, at the island of Cyprus. This done, we commence work simultaneously for an eastward as for a westward line; the first, whether at Ruad or Tripoli, or other point easily reached from Famagusta or Larnaca, to be continued for 850 miles to Kuwait, on the Persian Gulf; the second, at Karachi, to be carried along the Makran coast to Jashk, or a more convenient spot in the vicinity—roughly 500 miles by map measure.

ment, but nearer 700 by the telegraph route. These two completed, there would only remain the distance from Kuwait to Jashk, for which specially organized transports might be requisite. I do not consider it romancing to say that the voyage from Cyprus to Karachi might in this way be accomplished within a week, allowing a day and a half for embarkation and disembarkation. For instance let us reckon :—

Ruad or Tripoli, to Kuwait, 850 miles at 25 miles an hour,	
say.....	36 hours
Kuwait to Jashk, 600 miles by steamer, say .....	60 "
Jashk to Karachi, 700 miles at 25 miles an hour .....	30 "
	<hr/>
	126 "
Allowed for delays .....	30 "
	<hr/>
	156 "

or six days and a half.

Now I know that it may be said, " Why disembark troops at all at " Jashk, whence the sea distance to Karachi would enable them to reach " that port in twenty-four hours later than by train; or only twelve hours, " allowing for delay in disembarkation ? " To this I reply that twelve hours is an important gain in time, when the occasion is an emergency ; and that the delays in disembarkation would in some way be counter-balanced by the lesser inconvenience of getting men and baggage from trains to barracks than from transports in the harbour. And I further reply that the whole arrangement is only proposed as a primary step ; because the two sections of railway I advocate as an urgent measure, to be accomplished as early as practicable, are really but parts of a grand whole line of communication which *must* at some future period be made to connect east and west. The point at which the Euphrates is touched from Palmyra should eventually be a junction for lines from Scutari ; and who can say how many other quarters ; and again between that point and Kuwait, a line should strike off to the eastward, which, passing through Persia, should join the Perso-Baluch line at Jashk or in the vicinity.

Of such a line it had been my intention to have traced out the actual course ; but I fail, or at all events withhold a plan, from want of fuller data on the Kurdistan passes ; and it seem to me that the through line must be a remote even though a sure achievement. Any line leading to Ispahan would have an immense advantage in the fact that from that city eastward all is plain sailing up to the mountains below Karman ; whence my impression is, from more than one journey in the neighbouring districts, that there would be no great difficulties in selecting a means of passage to the Makran coast. But Ispahan is far north ; and Baghdad, Shustar, Shiraz, and Lar, seem to indicate a more direct communication with Karachi, and therefore a fitter supplement to the Euphrates Valley rails. Were it not for the comparative unprofitableness of the northern shores of the Persian Gulf, I should advocate the actual coast line as others have done before me ;

but there is just enough indecision on the subject to render advisable a pause which might result in bringing into the system an important town such as Shiraz, and penetrating the tracts between that place and Bandar Abbas by a more direct and shorter route than that of the sea coast. Mr. Gifford Palgrave tells the Committee that he has "landed at every little port, or possible place, along the whole length of that coast from Jashk to Bushire;" that "it is thinly peopled" but by no means desolate, or destitute of inhabitants; is well supplied with water;" and that "the mountains which line it, although not far from the sea, yet in hardly any case come down actually upon the sea, but leave a plain of various breadths, sometimes as much as twenty miles, sometimes less, which plain is perfectly well inhabited and well supplied with everything necessary to life."

Captain Felix Jones, on the other hand, does not consider Mr. Palgrave's view the right one, because his subject is clearly not regarded with the practical eye of a surveyor, but after the manner of a passing traveller without practical knowledge. He admits, however, that a railway along the coast might develop the traffic to a small extent, and he says nothing of physical difficulty. The question, however, is one for a further Commission to investigate and decide. In the meanwhile I see in Mr. Ainsworth's map of 1872, which illustrates the "proposed railway routes in Western Asia," and in Mr. Dawes' scheme for utilizing the River Kárun, matter for very serious consideration. In connection with the latter, Mr. Mackenzie's account of the road from Shustar to Ispahan is a useful paper, although the conclusion at which he arrives, that the said road would not be found "so difficult" or expensive for a railway as either that from Resht to Tehran, or "Bushire to Shiraz" is not thoroughly cheering. For the country between Resht and Tehran, and especially Bushahr and Shiraz, is one of mountains, passes, and ravines; of high tracts not to be attained, and of low tracts to be sedulously avoided. The main feature of the present argument is, however, that a comparatively direct line from the Mediterranean to India is feasible; and that once having spanned the Palmyra desert, and descended the Euphrates, the nearer we keep it to the sea coast the better for our general and regardless-of-expense purpose. I spoke of an old line of traffic from Tangiers to China: that line passed from the Euphrates to Basrah, Ahwaz, Fars, Karman, and Sind, on its almost interminable way. I am inclined to think that, in Baluchistan, it took the old road of Minab, the Fanoch Pass, Bintah, Gaih, and Kej to Baila.

Many of the places to which I have referred I know from personal experience. Jashk is one. It was a dreary spot when first contemplated as a telegraph station in 1862, and actually selected for the purpose in 1868; but it has of late years improved. Lieutenant Stiffe, Indian Navy, in his "Supplement to the Persian Gulf Pilot," published by order of the Lords Commissioners of the Admiralty, says:—

"Jashk Bay was the rendezvous of the English ships trading to

<sup>1</sup> Minutes of Evidence taken before Select Committee on Euphrates Valley Railway, p. 21.



"Persia before the Portuguese were dispossessed of Hormuz. . . .  
 "A small village has sprung up since the establishment of the telegraph  
 "station, and a few supplies can be got, such as sheep, fowls, a few  
 "vegetables, and various articles used by Europeans, but not in large  
 "quantities. . . . There is a little rocky point in Jashk Bay, . . .  
 "where there is a good landing, only a quarter of a mile north of the  
 "telegraph office. . . . The anchorage in Jashk East Bay is good  
 "during a *shamal*; but in a winter easterly gale it would be quite  
 "exposed. . . . A convenient anchorage for a vessel, not drawing  
 "more than 15 or 16 feet, is half a mile off shore. . . . A large  
 "vessel must anchor north-north-west. . . . A sailing vessel in  
 "December and March should be able to weigh, and moor round the  
 "point, if a heavy north-wester set in, of which she could get warning  
 "by telegraph from Henjam."

Here I should explain that Henjam is an island, of about 5 miles in length and  $2\frac{1}{2}$  broad, about 120 miles north-west of Jashk, and immediately south of the large island of Kishm, from which the channel which separates it is in one place only a mile broad, well situated as a rendezvous for vessels passing up and down the Persian Gulf; it was made one of our telegraph stations in 1869, when the cable was transferred to the Persian shores of the Gulf from the opposite coast at Ras Masandom. There is good shelter for ships there; and the place has certain advantages over Bassadore (or more properly Bassiduh), the old coaling station so familiar to the Indian Navy.

Though not entirely agreeing in the views put forward by the promoters of the old Euphrates Valley Railway project, I think that the reasoning was in the main sound, and the arguments brought forward enough to convince Government, as they did the Select Committee, that "if the enterprise were to be regarded simply as one affecting British interests, it would be the wisest course to adopt the shortest and most direct line not open to very obvious objections, and that "one of the two routes by the way of the Euphrates should be preferred." And now I may venture to touch upon the practical uses of the line already stated, but more than ever demonstrated by the occurrences of the last few years—otherwise of the interval between the last deputation on Mr. Andrew's proposal and the present time.

It was, perhaps, rash on my part to give a title to this paper so comprehensive as to include a state of things which might, almost equally and at the same time, affect two lines of Anglo-Indian communication so close together as those of the Euphrates Valley and Suez Canal. But this is really the great contingency of all, and unfortunately "possible." The long sea route is a very long one, whether we take into consideration the Isthmus of Panama with the Malay Straits, or restore to the Cape of Good Hope its old undivided glory. There, however, they are; and, though I commenced proceedings by putting them aside and am not going to dwell upon them now, I cannot but acknowledge their presence and "possible" uses, and feel thankful that we possess them as a *dernier ressort*. But let us, for an instant, look into these possible "contingencies" that would shut up both the Euphrates route and Suez Canal.

In the evidence before the Select Committee in 1872, I observe questions put to Captain Tyler as to the probable result of a Russo-Egyptian and Russo-Persian combination against us, the former on the Suez and the latter on the Euphrates Valley lines of communication. The reply is that "if Russia and Persia were to combine, then the Euphrates Valley would be more exposed; if Russia and Egypt were to combine, then the Suez route would be more exposed." I see a more dangerous combination than either, which might affect both routes simultaneously, that is, a Russo-Turkish one. Hence the necessity of striking while the iron is hot, or immediately securing a line by Treaty with the Sultan, which should be, to all intents and purposes, British; protected by a material force on the coast—not a ship or two, with a guard of marines, but an island, with garrison as well as depôt—and the eastern terminus of which could be reached in 90 hours from India, but in much less time from the entrance to the Persian Gulf. The shortness and directness of this line, constructed with English money, would be the truest guarantee of its intent and purpose—that it is, in fact, a mere link with India—and its original unprofitableness, in a money point of view, should prove that it is not designed to draw out the riches of the country, and direct them to the benefit of aliens. Eventually, if its example caused the formation of branch native lines, and such junction produced a golden harvest for parties concerned, the profit to England would have been legitimately acquired. I should be very glad to think a practical notion of this kind could find place among the minor considerations of the great Congress now sitting. For, if peace follow the present negotiations, which is at least probable, my humble opinion is that no time should be lost in carrying out some such end as that contemplated in the provision of a railway, which I rather call "Palmyrene" than "Euphrates Valley," whether its existence be provided for by payment, or in compensation for claims, or as part of an Anglo-Ottoman scheme of mutual benefit. If peace be lasting—a consummation devoutly to be wished—then would the establishment of the railway inevitably tend to the civilization and material good of a region too long neglected, and second to none on the face of the earth in interesting associations.

Supposing it were not Russia, but another chance ally of Turkey or Egypt, or of both together, which threatened our communication by Suez or Palmyra, and that the chapter of accidents contained an account of our failure to counteract the hostile combination. In such case we should have played our cards very badly to be shut out from the vast field of proposed communication with India, to which I have already adverted in describing the several northern projects. For I am fully convinced that some years hence, if none of these sketched-out lines actually join our Indian system, there will be no very long link left to complete, in at least one or two of the number.

I must apologize for putting before you a paper which want of time has compelled me to complete in a form less methodical than the importance of the subject demands. Those present who are agreed with me in the propriety of giving attention to an alternative Indian line to

that through Egypt, will greatly aid the cause advocated, by making practical suggestions on the description of carriage and railway gauge, and in the steam transports which appear most suitable to meet the requirements contemplated.

Mr. W. GIFFORD PALGRAVE: Speaking with all possible deference to the practised authority whose paper we have just heard, and in whose views I have the pleasure of entirely and thoroughly concurring, as far as the importance of the line is concerned, and as far as the advisability of making Cyprus, in a certain measure, the starting point of that line, I have only noticed one slight point in which I would venture to differ, as far as my personal experience of those countries goes, from Sir Frederic Goldsmid's case, namely, from the exact starting of the line from either Tripoli or Tyre, and conducting it through Palmyra. I myself visited Palmyra about the year 1861, and I went to it from the town of Hamah, which is about two days' horse-journey south of Aleppo, and I came back by the town of Homs, which lies somewhat further to the south. To both those places—Homs and Hamah—the starting point would not be from Beyrout or Tripoli itself, where the line of the Lebanon and Anti-Lebanon might be turned, and which would necessitate a great circle of route, but rather from the island of Ruad. Unfortunately, there does not appear to be any decent anchorage or any sufficiently sheltered place where vessels of any considerable size for transport could be made use of at that particular point of the coast. I have visited the island of Ruad. I went from Tripoli, and I think, on horseback, it took me fourteen or fifteen hours to get opposite to the island of Ruad, which was in sight of the shore. I do not remember having observed that there was any available point for an extensive landing point in that part. I think in that history will confirm me, as it makes no mention of that island ever having been used as a shelter or harbour for any anchorage. However, that would be the point to reach Palmyra. But I venture to hold the opinion which I gave several years ago, when I had the honour of being called before the Select Committee in 1872, that the proper landing point, and the one most in agreement with the proposed idea of Cyprus, would be Eskenderoon or Alexandretta. The first reason is that there would be a good harbour, which, with very little trouble, could be made into an excellent one, and possess the additional advantage of being unique, because it is well known that Jaffa is a wretched roadstead and Beyrout is not much better. The objection to it as a landing point is its unhealthiness. I admit that down on the coast, and where there is a large trading station which bears the name of Alexandra, there is a great deal of marshy intermittent fever; but I know, from residence there, that houses are placed on a little range of hills at a height of from 1,500 to 1,600 feet above the sea. This harbour of Eskenderoon resembles the harbour of Kingston, Jamaica, where the troops were: there was an amount of yellow fever, and so on, everywhere; whereas, on the contrary, when the station has been removed to the neighbouring camps of Up-Park and Newcastle, close to the harbour itself, the troops were as healthy as they could be in any station in England; consequently, I think the objection of the unhealthiness of Eskenderoon arises from the total want of attention on the part of the Government that at present occupies that part, to its present sanitary conditions. With very little difficulty a perfectly healthy spot might be selected, namely, at the hills of Beyland, immediately behind Eskenderoon, where, at a distance of an hour and a half from the landing place, the troops could be quartered in the most healthy manner possible, alongside the line, and be able to make use of it immediately. Secondly, the communications from Alexandretta and Eskenderoon to the Euphrates Valley are the best; all of them are those that are most used by the inhabitants of the country at the present day. It is observable, with reference to Palmyra, that the communications are very difficult indeed, not on account of the Arab or Bedouin tribes with whom, as Sir Frederic Goldsmid remarks, there would be no difficulty to make an arrangement; but from the want of water between the last station on the Syrian side and Palmyra, a distance of sixteen hours on horseback, there is not a drop of water at hand, and you are obliged to carry it with you. Starting from the other side of Palmyra the same difficulty exists. Water is found only in scarce



quantities and at great distances, and I do not think artesian wells could remedy that in time. The favourite route at the present moment, and which, according to Eastern history, has been the route ever since the breaking up of the Ottoman Empire, is that which, passing from Eskenderoon, passes over the Beilan Pass to Aleppo at a very small height. I have been over the line on horseback, and in no point has the line I believe to pass over a height of about 1,200 feet above the sea. It would reach from Aleppo through the pass down to Rakkah upon the Euphrates a little to the north-east of Palmyra or Tadmor, and then follow the line of the Euphrates. When we talk of conveying any large number of men for considerable distances, it might be under circumstances when there was very great heat, and a copious supply of water along the route is an important matter in order to contribute not only to the comfort but to the safety and the life of the troops, who would fare as badly as the unfortunate ambassadors mentioned by Sir Frederic, many of whom it seems died on the way. Therefore from these two motives, namely, that of a good starting point—and, I venture to say, a perfectly healthy starting point with very slight precautions—with the advantage of water along the whole route and with no engineering difficulties on the way such as high and difficult ranges, of course I would recommend the route from Eskenderoon by Aleppo down to Rakkah, and so along the line of the Euphrates, and from Rakkah southward. This would very nearly coincide with the Palmyra route. From observation I should say that that line would exceed the other line in length about 100 miles. On the other hand it would shorten the distance in this way, that Eskenderoon is much nearer to Cyprus than Ruad, and although the land route would be lengthened about 100 miles, the sea route would be shortened about forty or fifty; so, setting the one against the other, it is really, in so great a distance, hardly a point of importance. On that only point do I venture to differ from the very able lecture we have heard delivered. There is one point I would notice with regard to the northern coast of the Persian Gulf. That coast I did rather against my will in a small boat, touching the coast at every point; and I still maintain what I before stated, that as far as the engineering difficulties are concerned there are absolutely none. In taking a line from Bushire right as far as Jashk, the high promontory belongs to the other side. On the Persian side there is a range of mountains beginning south of Bunder Abbas and rising in height to the east. The spurs which come down to the sea coast, if any, are extremely small; at the same time I also concur with Sir Frederic Goldsmid in thinking for the moment that sea conveyance would be the most desirable. I would add one point about the harbour of Koweyt, which I visited and which is far to be preferred when the scheme comes up for consideration. It is certainly the most desirable. The population of that part of Arabia are, without exception, what we should call the most civilised of any whom I have come across. It has a very good harbour, and the population are the most civilised I have come across in the way of understanding the advantages of commerce and navigation, and consequently a certain amount of local assistance might be expected from them. From there would be a good starting point to beyond Jashk as far as I can judge from my own experience and the experience of others.

Mr. HADDAN, C.E. : I was late Engineer-in-Chief to the Turkish Government. The province which I had under my charge for eight years was bounded on the north by Aleppo and on the south by Jerusalem; and I think I can therefore give you a little information on the subject of the Overland Railway to India. I am sure you all will agree with me that Sir F. Goldsmid's suggestion of the Island of Cyprus, as an outpost, is a golden one, for you will see that it is quite as easy to get to it by water as it is to Constantinople, the proposed terminus of the Austrian State Railway; or rather, I should say, it is quite as near, and decidedly much easier. The line from Vienna to Constantinople would have to pass through Bosnia, in which country there is not a flat ten-acre field to be found; so that I think the question of a through European line may for some ten or twelve years be decidedly thrown on one side, and Constantinople be ignored. The only chance, therefore, we have in our time of getting to India by rail is decidedly from the Mediterranean. With all due deference to Mr. Palgrave, I may mention that the Beilan Pass is so close to Alexandretta that you cannot climb it by an ordinary railway. It is 2,200 feet above the sea-level, and at a distance of only 14 miles from the coast the gradients for a

railway would be 1 in 12, so that it would be another failure like the Mont Cenis, and without the ready-made road either. The question of the insalubrity of Alexandretta has been much exaggerated. During my period of office there I was instructed to drain the marshes. The whole thing could be done for 3,000*l.*, which is a mere bagatelle. My plans were published in the Blue Book on the Euphrates Valley Railway. In fact, it is not a marsh at all, the bottom being sand; but the sea, beating into the bay, has formed a sand ridge all along the littoral, which prevents the fresh water escaping into the sea; moss and all sorts of vegetation has sprung up, and the fresh water not being allowed to run off, a very undesirable smell arises from the putrefaction of the moisture. All along the coast from Alexandretta to Suez, there is no port or harbour at all, except Alexandretta. The apology for a quay is situated close to the town, and on the east side of Alexandretta Bay; but there is a fine natural harbour on the left-hand side of the bay, at Ayas. Starting from Ayas, after the Plain of Issus is traversed, you can commence to rise many miles sooner than when starting from Alexandretta itself; you may thus get over the Beilan Pass, and you also settle the question of insalubrity. The port of Seleucia or Suedia has been suggested, because there is no pass to get over, but there is no harbour, and the river has to be crossed seventeen times in running up the valley. And, moreover, between Seleucia and Alexandretta there is a famous point which is called Ras-el-Hanzir or the "Pig's Head," which is quite impassable even for foot passengers; so that it would be impossible to join this line to Europe. This is one of the main arguments in favour of Alexandretta as against Suedia, Tripoli, Tyre, and all the southern ports, and is the reason why the preference is given to Alexandretta in a commercial point of view. But I fancy Sir F. Goldsmid was not proposing the Palmyrene trace as a commercial speculation but merely a military line, and there is no objection, provided arrangements be made to join the European main line route at Aleppo, or some point even further inland, say Mardin. If we study all the Lebanon passes from Alexandretta south, you will find (1) Suedia, the outlet of the Orontes; (2) Tripoli, which is only 700 feet high; (3) Tyre, which is the natural outlet of the country, there being no pass since the Leontes debouches there. Beyrout is out of the question, as the road to Damascus passes the Lebanon range at over 3,000 feet elevation: it might have been turned, however, *viâ* Sidon. The learned lecturer referred to Baron Reuter's expedition to Teheran. The Shah of Persia was most anxious to have the work done under his own eye, and as he would not trouble to go to the Caspian end of the line, he insisted on the line being commenced at Teheran. The cost of the rails, owing to transport difficulties, I was informed by the engineer in charge of the line, reached such a point that they might have been made in silver on the spot. With reference to the Suez Canal, I saw a letter in the *Times* a week ago, signed by MacKillop Pasha, in which he states that he has provided such powerful dredging machines in the event of a steamer or vessel being sunk in the Canal, that he could cut a fresh channel in a week. There is one very bad place I may mention, near Ismailia, where such an operation would be out of the question: it is a rock cutting—the Suez Canal is not all sand, by any means. This cutting is something like 70 feet deep, and it is, in addition, situated on a very sharp curve. Now, if any political accident happened to a vessel in the Suez Canal, it is quite certain that it would occur at this point; so that the route to India by the Suez Canal might be perfectly blocked at any moment and in the simplest manner possible. The Egyptian Railway would not mend the matter, for there would be no reserve shipping at Suez. You may wonder why one could not make a line from Alexandretta to Meskineh, a town near Aleppo on the Euphrates, and thence adopt river transport. It is only about ten hours from Aleppo, or 180 miles from Alexandretta; but the Euphrates, as also the Tigris, are very tortuous and sluggish, and full of shoals. The height of the river at Meskineh is only 600 feet above the Persian Gulf, so the fall is not enough to cut a straight channel, and the consequent detours are so overwhelming that after hours you will come back almost to the spot where you started from. There are also weirs erected all along the river for irrigation purposes, the cost of buying up which precludes all idea of making the river navigable. Midhat Pasha, my chief, cut openings through the weirs and made them into rapids. It nevertheless took nineteen days to get from Baghdad to Meskineh. We had to stop at night and also frequently in the day

to cut fuel, &c., and in bad places we ran into sandbanks every five minutes. These seem trifles now when you are not in their midst, but on such an important route, such tedious and irksome delays would be fatal. The city of Aleppo is about 1,100 feet above the level of the sea, and the line from Alexandretta, viz., Aleppo to the Euphrates, has nothing more to recommend it over the Palmyrene line except that most important point Mr. Palgrave mentioned to you, viz., the question of water, which is a most important one; but for a strategical line I believe Captain Burton's proposed line from Tyre is the most feasible. It has been surveyed by the Turkish Government, and water borings were attended in every case with success. The importance of this matter with reference to the road to India has not, I may mention, been overlooked by Russia. Seven years ago they appointed a Consul to Aleppo, whom I knew intimately; and, without breaking confidence in any way, I may mention that this gentleman's whole business was to find out all he could about the Euphrates Valley Railway, and to place every possible obstacle in the way of its realisation. The English Consul at Aleppo mentions an obstacle to railway construction in those countries which, until I designed the Pioneer Railway some ten years ago, I myself found an insuperable one, and that is the question of labour. If you are going to make a railway of something like a thousand miles long, where are you to find the arms and the legs to make it with? In an agricultural country, especially after a war or famine, every man is better employed tilling the ground than in making unprofitable earthworks. In addition, a country like Turkey, where nearly the whole of the revenue is derived from agriculture, would certainly—the Consul thinks—be ruined during the six or seven years; the bone and sinew of the Empire were doing the English Government's work instead of their own. I have studied this difficulty as an engineer, and have succeeded in devising a system of railway which has no earthworks. It was described *in extenso* in this hall some ten days since, and can be executed at the rate of six miles a day with only 100 workmen per mile (foreigners). Being constructed entire in the workshop, its progress is unlimited, so that it could be laid down, not only from Alexandretta to the Persian Gulf, but, if you like, all the way to India in less than two years' time; and not require some twenty or thirty years before a steam communication could be accomplished in the usual manner. The Peninsular and Oriental mail subvention would suffice to guarantee the dividend of the "Pioneer," which, after supplying reliable statistics of traffic, &c., would make way for its successor, greatly aid its construction, and then be broken up into branches to feed the main line.

Lieutenant-General Sir ARNOLD KEMBALL: I think that if the intention, regardless of expense, were merely to connect the Mediterranean with the Persian Gulf, there would be no objection to the line proposed by General Goldsmid save in the physical obstructions pointed out by Mr. Palgrave; but the main objection is that it would not pay. Commercially it could not supersede the Suez Canal as a highway for ships from sea to sea without breaking bulk; and in the event of a Russo-Egyptian or Russo-Turkish combination Englishmen should more properly direct their attention to maintain their communications through Egypt and secure their position there, than to protect a railway extending for a thousand miles over a waterless desert through an enemy's country. For the transport of troops I believe that the necessity for repeated transshipment would render the gain in time very insignificant, and would bar the use of this line as a commercial highway. Moreover, if we were involved in a conflict with Russia on account of Turkey, this line would lie out of the region of strategical operations in that country.

My contention is that both for military and commercial purposes a grand trunk line from Constantinople to the Persian Gulf, with a branch from Alexandretta to Mosul or thereabouts, would be more advantageous to our interests; it would attract the traffic of the country through which it passed, and probably be remunerative over every section, whereas the proposed line would be devoid of any local traffic, and would merely furnish a means of communication between the Mediterranean and the Persian Gulf *en route* to India, much inferior, in my opinion, to that already existing through Egypt. Even as a means of direct communication from sea to sea, I should still prefer a line from Alexandretta to the Tigris, and thence *via* Baghdad to the Persian Gulf.

Koweyt possesses many advantages as the terminus of such a line, but it could



be hardly included in the larger railway scheme to India, as involving a *détour* from that port round the head of the Persian Gulf to meet the proposed line from Kurrachee. The junction of this line must more conveniently be effected by a branch from Baghdad *via* Howeizeh.

SIR FREDERIC GOLDSMID: Perhaps I may be allowed to say a few words as to what has fallen from Sir Arnold Kemball and Mr. Palgrave. I am quite aware that commercial considerations do not recommend the line that has been traced. I proposed it rather as one intended to meet an exigency, and which might be constructed in a very short time. With regard to the provision of water, it seems to me that the object contemplated would be worth the expense and trouble of wells. With regard to labour, I have no doubt there would be difficulty; but my opinion is that Arabs are very much inclined to give their labour if they can get what they are not accustomed to get—daily or weekly pay. I had once to dig a trench from the mouth of the Shat-el-Arab, the river conveying the combined waters of the Euphrates and Tigris to the sea. It was in length about three or four miles, and it was designed to bury the cable brought from the Persian Gulf up to a convenient spot for connection with the land-posts and wires of the Turkish Asiatic Telegraph. This part of the work was entrusted to me, and although rather novel in character, it was not distasteful, for it enabled me to acquire some knowledge of the Arab of the locality. It was not, however, an easy matter, for I could not at first get any sure amount of labour, and the labourers were somewhat refractory, that is, they were subordinate enough in one sense, but they were always fighting with one another. There were two main divisions, the Persian Arabs, and those from the Arabian side of the river, the Doásir and the Fas Arabs. However, it was my practice at the end of the day's work to make the men sit down in a ring and to see each one paid for his labour performed. This measure had an excellent effect. On the second day we got more than on the first, on the third more than on the second, and at last we got from three to four hundred men, who worked very well indeed. Physically speaking, they were just the set of labourers required for hard manual labour; and the week's experience showed me that, had we stayed where we were, we might have got as many men as we pleased. On the commercial question I will say little, but the railway would pass near enough to Mesopotamia to utilize it for the transport of grain from that renowned granary. After reaching the Euphrates it would in all probability become part of other systems which have in this been contemplated. I remember reading in a work on America that hotels were not commonly built there in places where there was any large number of residents and visitors, but where there were few or none. The hotel was not built to meet the requirements of a community, but the mere creation of an hotel attracted lodgers and frequenters, and the town followed. Much in the same manner a railway such as proposed (or say from Alexandretta), if it existed, would bring traffic to itself, and would, I believe, be found to be of great benefit commercially in its junction lines and generally in developing traffic and international intercourse. I will not trouble you with any further remarks on a very large question, and one on which much remains to be said, and will perhaps yet be said on a future or fitter opportunity.

THE CHAIRMAN: I am not going to presume to say more than a very few words on the subject of Sir Frederic Goldsmid's paper, especially as it is one which he has considered so long, and which all the other gentlemen have spoken upon with large personal experience and knowledge. I certainly was very much struck with what Sir Arnold Kemball said, because what we have to recollect in this case, I think, is not so much how serviceable to us some things appear likely to be in certain contingencies, as how these things are to be carried out. There is only one way in which such a scheme as this can be carried out, I believe, and that is by the vote of the English Parliament; and the question is, what arguments can be brought forward which would be likely to move the English Parliament to take up and give money for such a scheme. I think that is the great difficulty. Even if we had a railway across this greater isthmus, as we may call it, it would only be, as far as I can see, in preparation for a contingency which might or might not occur for years: and during all those years of waiting until this contingency occurred, I think there can be no doubt we should be making use of the Suez Canal, and not of this railway, for the transport of troops and for all other important purposes. It seems to me

difficult to conceive how such an expensive line could be maintained, perhaps for many years, waiting for this contingency, which might or might not occur. Moreover, it seems to me that the strong communications of England will always be those which we can approach most nearly, and guard most effectively with our fleets and our ships. Now the Canal has in that respect a vast advantage, and always will have ; and therefore it is, in my judgment, the line of communication on which we ought to concentrate our powers and efforts to preserve it open and accessible to us. As regards the possibility of its being blocked up, as Mr. Haddan indicated, no doubt this might very easily be done, but that is an argument why we should direct our energies, not only to securing our free use of the Canal, but also to the construction of a railway alongside of the Canal to meet such contingencies as that, in precedence of all other possible lines. That is a work which would be comparatively inexpensive, and the utility of which could not be questioned. However, as I said, I am not at this moment prepared to enter into a detailed discussion of the subject, and I shall pass on to a conclusion by moving the thanks of the meeting to our friend, Sir Frederic Goldsmid. I must say that I look with great admiration on a man whose time is so fully occupied as his is, and yet who grudges not to devote to a subject of this sort, not merely for the benefit of this Institution, but for the advantage of the public, who profit by his studies through these lectures, such an amount of labour, of rare experience, ability, and of originality, as he has gratuitously expended in the preparation of this lecture. I beg, then, now to propose that the thanks of the meeting be given to Sir Frederic Goldsmid for his admirable paper.

NAMES OF MEMBERS who joined the Institution between the 1st April and the 30th June, 1878.

#### LIFE MEMBERS.

Ingram, C. W., Capt. and Adj. Glamorgan Art. Vols.	Tumilty, J. S., Major 1st Lanc. Rifle Vols.
Christie, C. H. P., Lieut. R.E.	Prendergast, T. J. W., Lieut. R.E.
Hildyard, R. C. T., Lieut. R.E.	MacEachran, Dugald, Capt. 1st Renfrewshire Rifle Vols.
Dusgate-Dusgate, R., late Mid. R.N.	Bailey, E. H., Capt. 4th Surrey Rifle Vols.
Seymour, J. H. Clume, Lieut.-Col. late 82nd Regt.	
Turner, A. F., Lieut. R.N.	

#### ANNUAL SUBSCRIBERS.

Gillian, T., Colonel Madras Staff Corps.	Chamberlayne, W. J., Major-General, Unattached.
Oliver, W. S., M.D., Surgeon-Major A.M.D.	Underwood, S. E., Capt. 2nd Middx. Rifle Vols.
Addison, A. M., Capt. 71st Highlanders.	Moore, W. J., Lieut. R.N.
Bloomfield, J. A., Capt. and Adj. 1st Lanc. Engineer Vols.	Goldsmid, A. E. W., Lieut. 104th Regt.
Becher, Edwd. F., Lieut. R.A.	McCall, J. G., Lieut. Tobago Rifle Vols.
Boyes, H. C., Capt. Lon. Rifle Brigade.	McCall, James, Lieut. Tobago Rifle Vols.
Carter, E. M., Lieut. 34th Regt.	McCall, John, Capt. Tobago Rifle Vols.
Lane, R. B., Lieut. Rifle Brigade.	Elliot, J. W., Lieut. Tobago Rifle Vols.
Emerson, A. L., Major 28th Regt.	McKillop, John, Lieut. Tobago Rifle Vols.
Denshire, G. H., Capt. 51st Regt.	McCall, William, Lieut. Tobago Rifle Vols.
Kirkwood, Rev. Geo., Chaplain to the Forces.	McGillivray, D., Capt. Tobago Rifle Vols.
McLeod, W. K., Col. late 74th Highlanders.	Bevridge, J. Lock, Capt. late 12th Kent Art. Vols.
Finnis, J., Major 3rd Punjab Infantry.	Cotton, R. B., Capt. 99th Regt.
Bruce, E., Lieut. 19th Bengal Lancers.	Fyers, A. B., Lieut.-Col. R.E.
Powell, R. H., Dep.-Commissary A.S.C.	Hankin, Geo. C., Colonel 4th Bengal Cavalry.
Buchanan, H. J., Col. late 9th Regt.	Thompson, Ralph, Esq., C.B., Assist. Under-Secretary of State for War.
Elliott, Charles, Lieut. R.N.R.	Tanner, J. A., Lieut. R.E.
Anderson, H. C., Col. Ben. Staff Corps.	Maude, Eustace, Lieut. R.N.
Herd, W. G. R., Capt. 95th Regt.	Hussey, W. C., Lieut. R.E.
Mayne, W. C., Capt. late 5th Fusiliers.	Porter, R. da Costa, Lieut. R.E.
Bethune, Henry, Major late Roy. Surrey Militia.	
Napier, C. J., Lieut. 31st Regt.	
Orr, Spencer E., Capt. 94th Regt.	





# OCCASIONAL PAPERS, NOTES,

AND

## NOTICES OF BOOKS.

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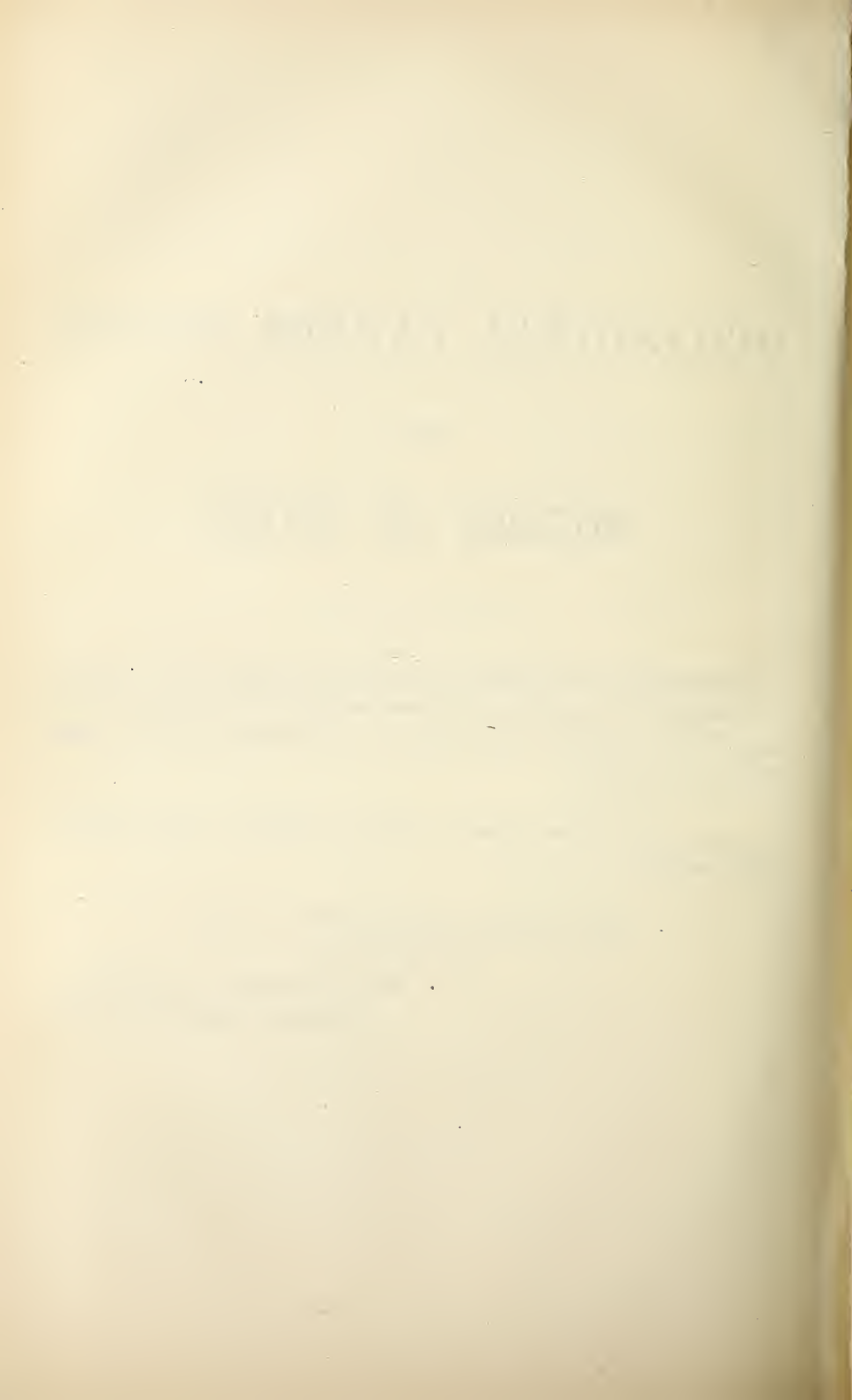
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LIEUT.-COLONEL LONSDALE A. HALE,

Royal Engineers,

Royal United Service Institution,

Whitehall Yard, London, S.W.





## ON THE ORGANIZATION AND STRENGTH OF THE GERMAN NAVY.

"THE Constitutional Statute of the German Empire," dated April 16th, 1871, recites, that the several Princes and States of Germany have formed "a perpetual union for the defence of the territory of the Empire and the laws current therein, and for securing the welfare of the German people." To provide for these objects, and to maintain public order in the country, some force under proper command was obviously necessary. This force was declared to consist of the Army and Navy. The administration of these two services, looked at from a constitutional point of view, differs considerably. The military forces of the German Empire are composed of the armies belonging to several states which formed part of the North German Confederation, or of the older union which existed prior to 1866. The Navy, on the other hand, is declared by the Constitutional instrument before mentioned to be a single undivided force under the command-in-chief of the German Emperor. The federal territory comprises the kingdoms of Prussia (as constituted subsequently to the treaty of Nikolsburg in 1866), Bavaria, Saxony, and Württemberg, the Duchies of Baden and Hesse, and twenty minor states. At the head of this union of states stands the German Emperor, who represents the Confederation, and has the right (within certain limits) of declaring war and concluding treaties of peace. In general he conducts, or has conducted in his name, the more important foreign relations of united Germany. The body charged with making laws, which concern the whole Empire, consists of two chambers, a Federal Council to which each state in the Confederation deputes a member nominated by the particular Government in proportion to its population and importance, Prussia sending the greatest number, viz., seventeen, and the majority of the remaining states one each. The whole number amounts to fifty-nine. The other chamber, called the *Reichstag*, consists of nearly 400 members elected for three years by universal suffrage and the ballot. Every German, not serving in the active portion of the national defences, who is full twenty years of age, has the right to vote for a member of the *Reichstag*. The Chancellor of the Empire presides, *ex officio*, in the Federal Council. This parliament meets annually, and makes laws with the assent of the Emperor. The Council nominates seven standing committees, each of which has cognizance of some branch of public affairs, and must contain representatives of at least four different states. The naval committee is nominated by the Emperor.

Though the latter sovereign is at the head of the entire land forces of the Empire, the unity existing in the Navy is not found in the Army. For instance, the Army of Bavaria consists of two army

corps, and is, during peace, under the independent command and administration of its own sovereign. The Württemberg troops are formed into a separate army corps, as also are those of Saxony. The two latter are clothed and equipped after the Prussian pattern, whilst the Bavarian Army retains its own uniform. Certain portions of the expenses due to the maintenance of their own forces are paid by both Bavaria and Württemberg. In addition to the Prussian Minister of War there are similar ministers in each of the three other kingdoms.

The Navy, on the other hand, belongs solely to the Empire at large, and is composed of the forces of no particular state. That is, in the legal sense, for in reality it is merely an expansion of the former Navy of Prussia, the only state of any size in the Confederation which the physical geography of the country permitted to be a maritime Power. The organic law of the Empire, before quoted, states, that—

“The Navy of the Empire is a single force under the supreme command of the Kaiser. The organization and composition thereof are determined by him; he appoints the Officers and departmental directors, who, together with the men of the fleet, take the oath of allegiance to him. Kiel and Jade (Wilhelmshaven) are Imperial naval ports. The sums necessary for the formation and maintenance of the Imperial fleet, and of the various establishments thereto belonging, are defrayed from the war-chest of the Empire. The whole nautical population of the Empire, including marine engineers and those belonging to the ship-building trades, is released from service in the Land Army, and instead, is liable to service in the Imperial Navy. The distribution of recruiting requirements is regulated with a due regard to the proportion of the seafaring population, and the *quota* appointed for each state is deducted from its liability to the land service.”

The department of the German Government immediately charged with the administration of the Navy is the Imperial Admiralty, at the head of which is an official named the “Chief of the Admiralty.” He conducts the business of his department under the responsibility of the Imperial Chancellor, and exercises the chief command under the Emperor. The orders of the latter must be countersigned by the Chancellor, with a view to establishing the principle of ministerial responsibility in force in constitutional monarchies, which the German Empire claims to be. The Admiralty is divided into a central division and several sections. Its composition is as follows:—

#### *Admiralty at Berlin.*

Chief (with the rank of Admiral), a Minister of State, who is entitled to represent his department in the Federal Council, and is a member of the Naval Committee.

Central Division.—A Commander in the Navy.

#### *A. Military Sections.*

Chief of the Staff—a Rear-Admiral.

Sect. Ia. Preparation for war and mobilization of the fleet.

„ Ib. Naval affairs (military branch).

Sect. II. General military affairs.

„ III. Training, intelligence, and coast defence.

Martial law department.

Sect. XII. Sanitary and medical affairs.

### B. *Technical Sections.*

Director—A Vice-Admiral.

Sect. IV. Equipment.

„ V. Dockyards and port administration.

„ Va. Accidents, collisions, &c.

„ VI. Naval construction.

„ VIa. Ship's history, inventories, and lists of stores.

„ VII. Construction of machinery.

„ VIIa. Steam factories, repair of boilers.

„ VIII. Gunnery, arms, fortification of ports.

„ T. Torpedo affairs.

### C. *General Sections.*

„ X. Returns and finance.

„ XI. Garrison administration.

„ XI. Service, travelling expenses, daily pay, &c.

„ XIII. Legal matters.

„ R. Audit of accounts.

„ IX. Harbour works.

„ IX. Buildings.

In addition, there is a hydrographical department, under the superintendence of a Post-Captain. It has two sections:—

Section H I, surveys, chart-drawing, pilotage, &c.

„ H II, scientific matters and literary work.

There are also three Admiralty Commissions and, at Hamburg, a Board for the supervision of German light-houses.

The coasts of the Empire are divided into two naval stations, viz., the Baltic and the North Sea. The head-quarters of the Baltic station are at Kiel. The supreme authority is in the hands of a Rear-Admiral, whose official designation is "Chief of the Naval Station." Under him are the 1st division of seamen, the division of boys, the 1st dockyard division, the battalion of marine infantry, the dockyards at Danzig and Kiel, the naval artillery and depôt at Friederichsort, the naval academy and naval school, the station commissariat department, the clothing store, and other branches of the public service in his district. The Staff is composed of three Aides-de-Camp, a Captain of the Port, a Medical Officer, two Accountant Officers, two Chaplains (one a Roman Catholic), and an Intendant or Commissary of Supplies. The Commandant of the place is a Colonel of the Army; the Town-Major an Officer of Marines.

The 1st division of seamen is commanded by a Post-Captain. It is divided into five detachments (each of two or three companies). These detachments are numbered consecutively from I to IV, but the fifth is named the Seamen Gunners' Detachment. The division of boys is under a Commander; it has an Adjutant, a Paymaster, a Chaplain,



and five Officers in charge of detachments. The 1st dockyard division is commanded by a Post-Captain. It is divided into two detachments, the 1st of engineers, and the 2nd of shipwrights and men of allied trades. Each is under a Senior Lieutenant. A Lieutenant-Colonel commands the marine battalion, of which the head-quarters and Staff, with four companies, are at Kiel, and two companies are at Wilhelms-haven.

The dockyard at Danzig is superintended by a Post-Captain, and the several departments are under the following functionaries:—a Director of Equipment, who is a Commander; a Director of Construction, a Director of Machinery, and an Administrative Officer, also styled Director. The Kiel yard is likewise under a Post-Captain, with two assistants; and, in addition to the functionaries specified as conducting the duties at Danzig, there are also a Director of Ordnance and one of harbour works. At Kiel are situated the naval academy and the naval school; the former under a Director (a seconded Officer of marines). The three classes (“*cötus*”) are each under a Senior Lieutenant. The Director of the academy is also head of the naval school. Another school, that of engineering and navigation, is likewise at Kiel; its Director is a Commander.

Wilhelmshaven, on the Bay of Jade, is the head-quarters of the North Sea station, which is also commanded by a Rear-Admiral. The Staff is similar to that of the Baltic. The command embraces the 2nd division of seamen, the 2nd dockyard division, the Wilhelmshaven dockyard, the marine artillery depôt, the pilot service, the observatory, the station intendance, and other departments. The divisions of seamen and of the dockyard are divided into detachments, in like manner with those at Kiel. At the head of this dockyard is a Post-Captain, with a Staff of Directors, the same as at the Kiel yard. The naval artillery depôt is commanded by a Major, and, in addition to the artillery Officers, contains a Torpedo Sub-Lieutenant, and six torpedo-ists; the latter wear a special uniform.

The Officers of the Imperial Navy are divided into three separate sections, viz., the Admiral’s Staff, the Sea Officers, and the Naval Staff. The Admiral’s Staff is thus described:—“It is an establishment in the German Navy corresponding to the General Staff of the Army, that is, it is a department on which devolves the duty, with respect to the organization and distribution of the Navy, of executing and transmitting the orders of the Commander-in-Chief.” The Admiral’s Staff consists of three Officers, who are appointed to superintend the organization of the Navy, and the improvement and perfection of the active forces. These Officers are promoted on a separate list. The Sea Officers are those who are engaged in the practical duties of the service afloat. The Naval Staff is composed of those who show some special aptitude for the several branches of technical work required in the Navy. The lists are made up as follows:—

Admiral’s Staff.....	1 Captain.
	9 Commanders.
	7 Senior Lieutenants. <sup>1</sup>

In German *Capitain-Lieutenants*, who occupy the same position as our Lieutenants of 8 years’ seniority.

Sea Officers .....	13 Captains.
	27 Commanders.
	53 Senior Lieutenants.
	117 Lieutenants.
	120 Sub-Lieutenants.
Naval Staff .....	1 Captain.
	6 Commanders.
	5 Senior Lieutenants.
	1 Lieutenant.
(Not Classed) .....	56 Midshipmen.
	36 Cadets.

The relative rank of Officers of the Army and Navy is much the same as that which is laid down in the regulations of our own service. There are four classes of Officers:—

<i>Army.</i>	<i>Navy.</i>
1. General Officers.	1. Flag Officers.
Field Marshal.	
General.	Admiral.
Lieutenant-General.	Vice-Admiral.
Major-General.	Rear-Admiral.
2. <i>Field Officers.</i>	
Colonel.	Captain. <sup>1</sup>
Lieutenant-Colonel.	Commander.
Major.	
3. <i>Company Officers.</i>	
Captain.	<i>Capitain-Lieutenant.</i>
4. <i>Subalterns.</i>	
1st Lieutenant.	Lieutenant.
2nd Lieutenant.	Sub-Lieutenant.

*Warrant and Non-Commissioned Officers.*

Sergeant-Major.	Warrant Officers, but senior to all ranks.
Ensigns.	Midshipmen.
Sergeants.	1st-Class Petty Officers.
	2nd-Class Petty Officers.

The pay of Officers of various ranks is given below:—

Vice-Admiral .....	£660
Rear-Admiral .....	495
Captain .....	420
Commander .....	315
Senior Lieutenant.....	225
„ „ .....	165

<sup>1</sup> Captains commanding squadrons are styled "Squadron Chiefs," and fly a Commodore's burgee. As in the British service, Commodore is not a substantive rank.

Lieutenant .....	£75
Sub-Lieutenant .....	60

*Medical Department.*

Surgeon-General .....	£300 to £420
Chief Staff Surgeon .....	210 to 270
Staff Surgeon .....	138
Assistant-Surgeon .....	60 to 69

*Engineers.*

Director .....	300 to 360
Chief Engineers .....	300
Engineer .....	225
Sub-Engineer .....	180

The above corresponds nearly with the "Half-Pay" of the British Service, Officers receiving it whether afloat or ashore. The additions are an allowance for messing when on board ship, and lodging allowance when on land.

Cadets must enter the service before the completion of their seventeenth year; but, in case of those who have passed the matriculation examination at a University, two years in addition are allowed. The examination takes place at Kiel annually, in April. Those who have qualified for admission to a University are exempt from examination. The cadets join the school-ship in April, and go for a cruise in the Atlantic or Mediterranean until September. Only such as show, on this trial cruise, that they possess the necessary qualifications for a seafaring life, are finally admitted to the school. They then are required to pass the examination for sea-cadet or midshipman. They next join a training-ship for two years, at the end of which they have to present themselves for the examination necessary to become Sub-Lieutenants. In all, four scientific examinations have to be passed, and three years' sea service has to be counted by the candidates before they become commissioned Officers. From October to August, in the last year of training, they attend the Officers' class at the naval school. When the final examination is passed, each Officer has to be balloted for by the Officers of the station to which he is to be attached. On their vote depends his admission to the service. Other examinations have to be passed before attaining the rank of Lieutenant. The two educational establishments for Officers are the Naval Academy and the Naval School. The Academy fulfils the same object for the Navy as the War Academy does for the Army. The course at it is two years. The school answers to the war schools of the land service, and, since 1865, has taken the place of the former institution for naval cadets at Berlin. The course at it lasts eleven months, divided into two terms.

Promotion in the German Navy goes practically by seniority. Owing to the enormous increase of the Service within a very few years, the age of most of the Officers is much lower than that of the members of the Services of other countries. The date of commission of the senior Captain is February 15th, 1871, of the senior Com-



mander January 23rd, 1871, of the senior Lieutenant February 27th, 1872. Only two Officers on the Captain's List count as much as twenty years' sea service in all.

Every German is liable to service in the Army or Navy, and substitutes are not allowed. Exemptions are permitted to members of reigning families, and of mediatised and other houses exempted by conventions or by special right, and to some others duly enumerated in the law of recruiting. The liability to serve begins with the completion of the seventeenth year, and ends with that of the forty-second. Of this time twelve years must be passed in the fleet and in the *Seewehr*. On the 1st January of the year in which the twentieth birthday occurs every one must enter the standing Army or join the fleet. The regulations prescribe that any youth, whose physical and moral qualifications are satisfactory, may volunteer to join the Service on completing his seventeenth year. The period of voluntary service is either one year or three years. With regard to the one year's service the provisions of the law are as follows:—

Seamen by profession who have passed the Navigator's Examination at a North German Navigation School are enrolled at once in one of the divisions of seamen. They must have been employed at least one year at sea, or in the coasting trade, or in the deep-water fishery. Having once entered they are compelled to serve in the ship to which they belong until her return to a home port. They are not required to provide their clothing nor maintain themselves. Volunteers are admitted under similar regulations into the engineer branch of the Service and to the dockyard divisions. The latter are required to find their own clothes and subsistence.

Volunteers for three years' service who wish to join as sailors must have been employed at the least one year in some seafaring occupation. Persons may enrol themselves for the same period in either the engineer detachment or the shipwright detachment of the dockyard divisions.

The division of boys is intended to train seamen and petty officers for the Imperial Navy. The period of training is three years. At the completion of the training the boys are rated seamen, and join one of the divisions. Promotion to leading seaman's and petty officer's ratings depends upon the conduct and qualifications of the lads who have been under instruction. Those who do not come up to the standard required at the end of three years' instruction may be retained to undergo a fourth year's training. Nine years in addition have to be served after enrolment in a division. The age of entry of boys is between fourteen and seventeen. There are two training ships for cadets, one for boys, and three brigs: the three last are at present in the reserve.

Length of service in the Navy is, as has been stated, twelve years in all. Of these three are passed in the active Navy, seven in the Reserve, and five in the *Seewehr*. Formerly men for the Navy were raised exclusively from the seafaring population of maritime states; but it has been found necessary, in order to obtain sufficient numbers, to draw upon the shore-going population. Volunteers who engage to

serve for four years may be entered, though they have not made long voyages. The annual contingent of recruits for the Navy is estimated at 2,500 men.

The Officers of the Naval Reserve are—

- 1 Senior Lieutenant.
- 1 Lieutenant.
- 25 Sub-Lieutenants.
- 22 Midshipmen.
- 1 Cadet.
- 1 Assistant Paymaster.

The Officers of the *Seewehr* are—

- 2 Senior Lieutenants.
- 14 Lieutenants.
- 19 Sub-Lieutenants.
- 3 Auxiliary Lieutenants.
- 2 Second Lieutenants.
- 2 Assistant Paymasters.

The number of men and boys at present is as follows :—

*Seamen Divisions.*

- 89 warrant officers.
- 14 writers.
- 593 petty officers.
- 4,628 seamen.

*Boys' Division.*

- 1 warrant officer.
- 1 writer.
- 9 petty officers.
- 400 boys.

*Dockyard Divisions.*

- 134 warrant officers.
- 4 writers.
- 1,548 petty officers and men.
- 68 hospital attendants.

*Naval Police.*

- 75 Masters-at-Arms and Sergeants.

The maritime forces consist of a detachment of artillery and an infantry battalion. The artillery detachment was ordered in April, 1877, to be broken up and be replaced by a detachment of seamen gunners. This order does not appear to have been fully carried out as yet, as Officers of marine artillery still appear on the Navy List. The detachment comprised three companies, commanded by a Major. The other Officers were three Captains, three First Lieutenants, and seven Lieutenants. The non-commissioned officers and men numbered from 457. The strength of the infantry battalion is—

- 1 Lieut.-Colonel Commanding.
- 6 Captains.
- 6 First Lieutenants.
- 19 Lieutenants.
- 1,035 Non-commissioned officers and men.

The battalion is divided into six companies, and the naval police is attached to it. Two First Lieutenants and eight Lieutenants belong to the Reserve and the *Seewehr* of the marines.

The Torpedo Corps of the German Navy is officered by a Torpedo-Lieutenant and two Torpedo-Sub-Lieutenants. The torpedo men are divided into several classes, viz., chief torpedoists, who rank with first class warrant officers; torpedoists, who rank with those of the second class; chief torpedo mates, ranking with sergeants, and torpedo mates with corporals. A Torpedo Committee, composed of Officers of the Navy and Military Engineer Corps and a scientific chemist, sits at Berlin.

The Medical Department of the German Navy is composed of—

- 1 Surgeon-General, 2nd class.
- 2 Chief Staff Surgeons, 1st class.
- 3   "       "       "       2nd class.
- 15 Staff Surgeons.
- 13 Assistant Surgeons, 1st class.
- 10   "       "       2nd class.
- 2 Under Surgeons.

In the Engineer Department there are—

- 2 Chief Engineers.
- 6 Engineers.
- 9 Sub-Engineers.

The junior ranks of the department are petty officers (*maat*), and are not included in the list of Officers.

The Accountant Department contains—

- 15 Paymasters.
- 27 Sub-Paymasters.

The Chaplain's Department consists of—

- 7 Chaplains (Evangelical).
- 1   "       (Roman Catholic).

The dockyards are three in number, situated at Danzig, Kiel, and Wilhelmshaven. The two latter, as has been stated above, are Imperial naval ports. Danzig, in the eastern part of Prussia, stands on a river thirty-five miles from the coast of the Baltic. It is a fortress of the first class, and contains 87,650 inhabitants. In 1872 the *Reichstag* voted sums amounting to upwards of 520,000*l.* to strengthen its defences and form a naval yard. The works still continue. The yard was to be completed by this year (1878), and the new harbour by 1887. The object of establishing a naval yard at Danzig is said to be to have a repairing station and depôt for a fleet operating in the Baltic.

Kiel is situated on the eastern coast of the province of Holstein.



The harbour is large and has room for the largest ships. The depth of water varies from six to nine fathoms. Deep water extends so close in shore that the heaviest ships of war can lie alongside the wharves. The harbour is but little affected by tides. Though its strategic position is not considered very superior, still Kiel is one of the greatest naval ports in the world. On both sides of the entrance stand the strong fortifications of Friederichsort. The population is, 40,000.

Wilhelmshaven is on the coast of the North Sea in the district of Jade, on the bay of which name it stands. It was established as a German naval port in 1869. It is strongly fortified both on the sea front and on the land front. The works of the dockyard are on a very extensive scale, and large sums of money have been spent within a few years upon them and upon the fortifications. The principal basin is about 400 yards long and 250 wide. The population, exclusive of the persons employed in the Government establishments, is unimportant. The strategic situation of Wilhelmshaven is good, inasmuch as it gives to the Empire a port which cannot be so easily blockaded as those in the Baltic. The latter sea can be entirely closed by a superior naval power, whereas Wilhelmshaven, being on the North Sea, has access to the ocean. A canal, one side of which is on the foreign territory of the Netherlands, has been constructed to facilitate communication with the port in time of war.

The guns mounted in the ships and ships' boats of the German Navy are those constructed on Herr Krupp's well-known system. They are all breech-loaders. The carriages are of iron. A peculiarity of the breeching fittings of broadside guns is that the bight is towards the ship's side where it is dropped over hook-shaped breeching-bolts, and that the ends—in each of which an eye enclosing a thimble is spliced—are attached to the brackets of the carriage. The 30½ centimetre (12-inch) gun is carried by the armoured gunboats "Wespe" and "Viper." Turret-ships and the central battery-ships of recent construction carry 26 centimetre (10-inch) guns. The "König Wilhelm" is armed with eighteen 24 centimetre (9½-inch), and five 21-centimetre (8¼-inch) guns. The "Hansa's" guns are eight 21-centimetre pieces. The lighter guns carried in some ships are 17 centimetres (6½ inches). The boat-gun is a piece of 8 centimetres (3 inches) calibre. Details of the above guns follow:—

Nature.	Weight met. tons.	Battering shell.		Shell.		Charge.		Energy of batter- ing shell.	Thickness of armour pierced.
		Weight.	Burster.	Weight.	Burster.	Batt' ring	For shell.		
c.m.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	foot-tons.	inches.
30½	35·6	740	9½	610	32½	158½	158½	12,221	10½
26	18	412	5½	361	17¼	105½	105½	6,802	8½
24	14·5	310	3¼	261	15½	59½	44	4,625	7¼
21	9	216	2¾	174	10½	35¼	26½	2,587	5¾
17	4·5	120	1¼	99	6½	17½	14½	1,398	3¾
8	·23	..	..	7½	¾	..	1		

The above are approximate to avoid small fractions. The metric ton is somewhat lighter than the English. The kilogram has been taken as = 2·2 lbs.

The rifled small arms in use in the Navy are of a pattern similar to that with which certain corps in the land service are armed. Whilst many improvements and alterations are being made the Government is careful to keep the fleet supplied with the best weapons.

It has already been said that there exists a special torpedo service, of which the officers and men wear a particular uniform. Their work seems to be chiefly in the laying down of defensive torpedoes for the protection of the coasts and harbours of the Empire. Torpedo experiments were begun in North Germany in 1868, but no conclusions as to the best system to be adopted had been reached when the war with France occurred in 1870. The consequence was that a very small amount of torpedo stores were at hand; and in the early days of the war old beer casks, and similar articles, were made use of as the cases of contact torpedoes on Jacoby's system, with which to defend the most exposed parts of the coasts. But pear-shaped cases of iron were introduced as soon as possible. The torpedoes used by the Germans during the war are thus described: 1. Contact torpedoes with fuzes on Jacoby's system. The glass tube containing the sulphuric acid was enclosed in a leaden tube. The latter was to be bent on the torpedo being struck by a ship and the glass broken. The charge of the mine was 75 lbs. of powder or other explosive; and it was moored with chains and stones. 2. Electric torpedoes with platinum wire fuzes to be fired by observers, provided with glasses on shore. The charge was 10 cwt. of powder, and they were anchored with stones or mud anchors. 3. Harvey torpedoes of the usual pattern. 4. Spar-torpedoes worked from boats. Of late, in common with other maritime powers, Germany has paid much attention to the improvement of torpedoes. The Torpedo Committee is a permanently constituted body, and many experiments have been carried out under its direction. The object of these has been stated to be, to find out: 1st. The best mode of anchoring; 2nd. The most useful form of case; 3rd. The best manner of laying out mines and the distances at which they should be placed from each other; 4th. The best material for the explosive used as a charge and the one least likely to deteriorate by long immersion; 5th. The best description of fuze. As a result of these experiments the present state of the torpedo service in the German fleet is probably not inferior to any in the world. On the list of the Navy there are at present seven torpedo vessels; of these two are designated "mine-layers" and two "*prahms* for mines." The "*Zieten*" was built in England and launched in May, 1876. She is 196 feet long, has 28 feet beam, and draws 11 feet 6 inches. She is 873 tons, her indicated horse-power is 2,350, and she has made sixteen knots. She has a complement of ninety-one. The hull is constructed of iron and she carries, in the bow and in the stern, apparatus for launching fish torpedoes under water. The tubes are 4 feet 3 inches under water, 16½ feet long, and 1¼ feet in diameter. The "*Uhlán*," built at Stettin and launched in 1876, is 72 feet long, has 26 feet

beam, and draws 13 feet of water. Her tonnage measurement is 364, and the engines work up to 800 indicated horse-power. The keel-line of the vessel is produced forward to a length of 32 feet in the form of a spur made of steel; at the extreme end of this a torpedo is to be fixed. It is proposed to adopt with this vessel the manœuvre of running against an enemy and exploding the torpedo in contact. In order to secure the craft against the explosion of her own torpedo the fore part is double. In the space between the inner and the outer skin is inserted an elastic mass composed of a mixture of cork and marine glue, so that—in case of injury to the outer plating—the vessel may still remain afloat.

The Officers of a German man-of-war are distributed into messes somewhat in the same way as in the British Navy. The Captain messes alone. Ships are—as a rule—commanded by Captains and Commanders, gunboats by senior Lieutenants. Occasionally a Commander is second in command of a large ship; but almost invariably that office is filled by a Senior Lieutenant (*Capitain-Lieutenant*). The Officer next in seniority to the second-in-command is usually charged with assisting the Captain in the navigation of the ship. He has charge of the charts and instruments of navigation, and makes the necessary astronomical and meteorological observations, under the supervision of the Captain. The next senior Officer is usually styled "*Batterie Commandeur*," and has a general superintendence of the exercise of the heavy guns. Officers commanding "quarters" or divisions of guns are styled "*Batterie Offiziere*." This includes those who superintend the passage of ammunition in action, and command divisions of sail-trimmers, boarders, small-arm men, and riggers. The second-in-command heads the landing-party of small-arm men, &c., whilst the Captain, the navigating Officer, and the Battery Commander remain in the ship. The remaining Officers are divided into watch-keepers (*wachthabende Offiziere*), and mates of decks (*oberdecks Offiziere*). The whole number of Officers and men of a ship are thus divided:—

### I. *Staff (Stab)*.

Captain.	Cadets.
Second in command.	Marine Officers.
Navigating Officer.	Engineers.
Battery Commander.	Medical Officers.
Watch-keepers.	Paymaster.
Sub-Lieutenants.	Chaplain.
Midshipmen.	

### II. *Under Staff (Unter-Stab)*.

Junior Accountant Officers.	Ship's cook.
Writers.	„ stewards.
Ship's police.	Assistant stewards.



III. *Seamen personnel.*

Gunner and crew.	Seamen.
Boatswain and petty officers.	Boys.
Leading seamen.	

IV. *Engine-room personnel.*

Leading engineers.	Engineer's mates.
Watch-keeping ditto.	Stokers.

V. *Artificer personnel.*

Carpenter and crew.	Butcher.
Sailmakers.	Sick berth attendants.
Armourers.	Shoemaker.
Painters.	Tailor.

VI. *Marines.*

Sergeant.	Buglers and drummers.
Corporals.	Privates.

VII. *Servants.*

Officers' cooks.	Officers' stewards.
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The ships of the German Navy are divided into two classes: (1) ships, and (2) vessels (*Fahrzeuge*). There are four rates of ships and three classes of vessels.

Ships	Rate	I	"König Wilhelm," &c.,
		II	{ "Kronprinz," "Friederich Carl," "Preussen," "Renown" (gunnery ship),
		III	{ Main-decked corvettes, Sailing frigates { Guard ships, Training ships for cadets,
		IV	{ Flush-decked { "Victoria," "Augusta," corvettes { "Frega," "Ariadne," "Louise," "Medusa," "Nymphe," Armoured "vessels" { "Arminius," "Prinz Adalbert," The Royal yacht, Boys' training brigs, Cadets' " " "
Vessels	Class	I	{ "Preuss," "Adler," "Nautilus," "Albatross," "Falke,"
		II	{ "Pommerania," Despatch boat,
		III	{ Gunboats of 60 h.p. " "

The following is a list of the complement of a large first-rate iron-clad of the "Kaiser" class:

Commanding, 1 Captain.	3 leading engineers.
Second in command, 1 Commander	3 engineers.
Navig. Officer, 1 sen. Lieutenant.	5 chief engineer's mates.
Battery Comm., 1 ditto.	11 engineer mates.
Watch-keepers, 4 do. or Lieuts.	2 leading firemen.
7 Sub-Lieuts.	5 firemen.
12 Midshipmen.	17 leading stokers.
1 First Lieut. of Marines.	51 stokers.
1 Engineer Officer.	1 chief carpenter.
1 Chief Staff Surgeon.	2 carpenter's mates.
2 Assist.-Surgeons.	1 leading carpenter's crew.
1 Paymaster.	4 carpenter's crew.
2 Assist. ditto.	1 chief sailmaker's mate.
1 storekeeper.	1 sailmaker's mate.
1 writer (petty officer).	2 sailmaker's crew.
1 master-at-arms.	1 chief armourer's mate.
3 ship's corporals.	1 painter.
3 lance corporals.	1 painter's crew.
1 petty officer, ship's cook.	1 butcher.
1 leading seaman do.	1 chief sick berth attendant.
1 steward (petty officer).	2 assistant ditto.
1 assist. ditto.	2 shoemakers.
1 chief gunner.	1 tailor.
1 chief gunner's mate.	1 sergeant.
4 gunner's mates.	5 corporals
1 chief boatswain.	1 drummer
8 chief boatswain's mates.	1 bugler
18 boatswain's mates. <sup>1</sup>	70 privates
80 leading seamen. <sup>1</sup>	4 Officers' cooks.
234 seamen.	4 Officers' stewards.

Total 600.

Marines are only embarked in the 1st and 2nd rates. From the above list it will be seen that, not including the Officers or warrant officers, and omitting even the sailmakers, there are 345 *bonâ fide* blue jackets among the ship's company.

The seafaring population of the Empire is estimated at 80,000.<sup>2</sup> The number of merchant vessels is 4,809,<sup>3</sup> of which 318 are steamers. The four great Trans-Atlantic steamship Companies are—

1. The Hamburg American Joint Stock Packet Company.
2. The North German Lloyd.
3. The Hamburg South American Steam Navigation Company.
4. The German Trans-Atlantic Steam Navigation Company, or "Eagle line."

Of the Hamburg American Company nine ships of from 2,500 to 3,200 tons are on the New York line; three of from 2,500 to 2,900

<sup>1</sup> The boatswain's mates include captains of parts of the ship.

<sup>2</sup> Of whom 6,000 are in foreign employ.

<sup>3</sup> Total tonnage 1,103,650, of which 180,946 tons are steam.

tons on the New Orleans line; three of 2,200 to 2,500 tons on the West Indies line. For the above routes four ships of from 3,000 to 3,500 were building or nearly complete last year; and three of 1,200 tons were being built for the inter-colonial service. There are two vessels for European voyages, and three river steamers also belonging to the Company.

The North German Lloyd has fourteen steamers of from 3,048 to 4,434 tons on the New York line; four of from 3,050 to 3,090 tons on the Baltimore line; four of from 3,262 to 3,900 tons on the New Orleans line; two of the West Indies line; one of 1,377 tons for inter-colonial service; six building or nearly complete for the above-mentioned lines; nine steamers of from 718 to 1,025 tons to run between London, Hull, Leith, and Antwerp, and Germany; besides fourteen vessels for river and coast trade.

The Hamburg South American Company plies between Germany and the South American ports of Bahia, Rio de Janeiro, Santos, Monte Video, and Buenos Ayres. It has six steamers of from 2,000 to 3,500 tons.

The "Eagle Line" vessels in general measure about 3,600 tons, and run between Hamburg and New York. Though only established in 1873, it has four ships running, and steps have been taken to add to them four more. The whole of the above vessels may be regarded as supplying an important reserve both of ships and sailors to the Imperial Navy.

The Navy Estimates for the financial year 1877-8 were for

Regular expenses.....	£1,114,230
Special expenses .....	1,284,611

Total..... £2,398,841

The following is an official list of the ships and vessels of the German Navy, as given in the Admiralty List for the present year:—

Name.	Guns.	Tonnage.	Displacement.	I.H.P.	Completion.	Present service.
		Englis				

### A. Fighting Ships.

#### 1. Armoured Frigates.

"König Wilhelm".....	23	5,939	9,603	8,000	700	Reserve.
"Kaiser".....	9	4,586	7,559	8,000	600	Do.
"Deutschland".....	9	4,586	7,559	8,000	600	Do.
"Friedrich Carl".....	16	4,003	5,912	3,500	500	Do.
"Kronprinz".....	16	3,404	5,480	4,800	500	Do.
"Friedrich der Grosse"	6	4,118	6,663	5,400	500	Making trial cruizes.
"Preussen".....	6	4,118	6,663	5,400	500	In commission with reduced crews.
"Grosser Kurfürst"....	6	4,118	6,663	5,400	500	Building.



Name.	Guns.	Tonnage.	Displacement.	I.H.P.	Complement.	Present service.
		English tons.				

## 2. Armoured Corvettes.

"Hansa" .....	8	2,372	36,110	3,000	380	Reserve.
"A" .....	6	5,034	..	5,600	..	Building.
"Sachsen" .....	6	5,034	..	5,600	..	Fitting out.
"C" .....	..	..	..	..	..	Building.
"D" .....	..	..	..	..	..	Do.

## B. Cruisers.

### 1. Main-decked Corvettes.

"Elizabeth" .....	19	1,996	2,468	2,400	380	Cadet training ship, China station.
"Hertha" .....	19	1,846	2,264	1,500	380	Mediterranean.
"Vineta" .....	19	1,846	2,264	1,500	380	Reserve.
"Gazelle" .....	18	1,691	2,067	1,300	380	Mediterranean.
"Leipzig" .....	12	2,856	..	4,800	425	Training ship, China station.
"Sedan" .....	12	2,856	..	4,800	425	Fitting out.
"Bismarck" .....	16	2,353	..	2,500	..	Do.
"Blücher" .....	..	..	..	..	..	Do.
"Moltke" .....	..	..	..	..	..	Do.
"Stosch" .....	..	..	..	..	..	Do.
"D" .....	..	..	..	..	..	

### 2. Flush-decked Corvettes.

"Freya" .....	8	1,663	1,985	2,400	230	China station.
"Ariadne" .....	8	1,309	1,692	2,100	230	Australia.
"Luise" .....	8	1,309	1,692	2,100	230	Reserve.
"Augusta" .....	10	1,550	1,796	1,300	230	Australia.
"Victoria" .....	10	1,550	1,796	1,300	230	Reserve.

### 3. Gun Vessels ("Albatross" Class).

"Albatross" .....	4	601	705	600	95	China station.
"Nautilus" .....	4	601	705	600	95	Do.

### 4. Gunboats, 1st Class.

"Comet" .....	4	304	347	250	64	Mediterranean.
"Cyclops" .....	4	350	..	250	64	China station.
"Delphin" .....	3	304	347	250	64	Reserve.
"Drache" .....	3	304	347	320	64	Do.
To replace "Meteor" ..	4	428	..	340	64	Building.
" " "Blitz" ....	4	428	..	340	64	Do.
" " "Tiger" ....	..	..	..	..	..	Do.

## C. Coast Defence Vessels.

### 1. Armoured Vessels.

"Arminius" .....	4	1,230	1,583	1,200	130	Reserve.
"Prinz Adalbert" .....	3	779	1,479	1,200	130	Do.

Name.	Guns.	Ton- nage.	Dis- place- ment.	I.H.P.	Comple- ment.	Present service.
		English tons.				

2. *Armoured Gunboats.*

"Wespe" .....	1	784	..	700	64	Fitting out.
"Viper" .....	1	784	..	700	64	Do.
"Biene" .....	1	784	..	700	64	Do.
"Mücke" .....	1	784	..	700	64	Do.
"Scorpion" .....	1	784	..	700	64	Do.
"F" .....	..	..	..	..	..	Building.
"G" .....	..	..	..	..	..	Do.

3. *Torpedo Boats.*

"Zieten" .....	..	..	..	2,350	91	Kiel.
"Uhlán" .....	..	364	..	800	..	Do.
Minelayer No. 1 to 5....	..	24	..	60		
Do. No. 6 .....	..	34	..	80		
"Rival" .....	..	129				
Mining-prahm "Basilisk"	..	304				
Do. "Pfeil" ..	..	239				

4. *Gunboats, 2nd Class.*

"Fuchs" .....	1	239	264	220	40	Reserve.
"Hay" .....	1	239	264	220	40	Do.
"Natter" .....	1	239	264	220	40	Do.
"Salamander" .....	1	239	264	220	40	Do.
"Sperber" .....	1	239	264	220	40	Do.
"Otter" .....	3	..	..	..	..	Fitting ont.

D. *Despatch Vessels.*

"Falke" .....	2	1,030	..	1,100	90	Reserve.
"Pommerania" .....	..	406	..	700	44	Mediterranean.
"Loreley" .....	2	332	398	350	56	Tender, Wilhelmshaven.
"Grille" .....	..	493	..	650	52	Imperial yacht, Reserve.
"Hohenzollern" .....	2	1,500	..	3,000	120	Do.

E. *Transports.*

"Rhein" .....	..	279	498	200	23	Reserve.
"Eider" .....	..	146	..	120	16	Do.

F. *Training Ships.*1. *Line-of-Battle Ship.*

"Renown" .....	23	3,318	5,519	3,000	200	Gunnery ship, Wil- helmshaven.
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2. *Sailing Frigate.*

"Niobe" .....	10	1,052	1,290	..	240	Reserve.
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3. *Main-decked Corvette.*

"Arcona" .....	18	1,691	2,067	1,300	380	Reserve.
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Name.	Guns.	Ton- nage.	Dis- place- ment.	I.H.P.	Comple- ment.	Present service.
		English tons.				
4. <i>Flush-decked Corvette.</i>						
"Medusa" .....	9	970	1,183	800	240	Boys' training ship, West Indies.
"Nymphe" .....	9	970	1,183	800	240	Reserve.
5. <i>Sailing Brigs.</i>						
"Rover" .....	6	550	..	..	150	Do.
"Mosquito" .....	6	550	..	..	150	Do.
"Undine" .....	6	608	..	..	150	Do.

#### G. *Vessels for Harbour Service.*

(This class contains small steamers, tugs, floating barracks, and pilot vessels. The whole number on the list is eighteen.)

Of the armoured vessels on the above list only two, the "Hansa" and "Prinz Adalbert," are of wood. The others are built of iron, and in their construction nearly all the most recent improvements in iron war-ship building have been introduced. Few, if any, of them, however, have the longitudinal bulkhead dividing the boilers, which has been adopted in the later English armoured ships. The most powerful vessels have been built in England, but the Vulcan Company's Works near Stettin, as well as the Government yards, are capable of turning out formidable vessels. The "Grosser Kurfürst," for instance, was built at Wilhelmshaven. Great efforts have been made to increase the capabilities of the steam factories and engine works of the country, so that the Empire should be no longer dependent, as it has been, upon foreign manufacturers for the supply of machinery for even the largest ships. A recent statement has been published to the effect that this is now the case, and that the Imperial Navy will no longer have to look abroad for engines for its vessels of any class.

The want of properly qualified seamen for both the Government Service and the mercantile marine having been felt for some time past in Germany, efforts have been made by private persons interested in the shipping trade to establish training vessels for boys with a view to their becoming apprentices to the seaman's calling. These efforts have been encouraged by the Government, which naturally sees in them a probability of strengthening considerably the available Naval Reserve, all the seafaring population being liable to service in the Imperial Navy.

The ships in commission are distributed over four foreign stations as well as the home waters. These stations are—(1.) the Mediterranean, with four vessels, under the command of a Post-Captain as Squadron-Commander; (2.) the China, or East Asiatic station, with six vessels; (3.) the South Pacific, with two; and (4.) the Western



Atlantic, with one. Other vessels, as appears from the list of the Navy given above, are making detached cruizes in foreign waters. At home there are two sea-going ironclads in commission. It has for some years past been customary to assemble a squadron of armoured ships for exercise in various evolutions and manœuvres each summer, and keeping them together till the early autumn, when the ships are laid up.

CYPRIAN A. G. BRIDGE, Captain.

## THE RUSSIAN NAVY IN 1877.

(Translated from the *Révue Maritime*, April, 1878.)

At the moment of the declaration of war the Russian Baltic Fleet was still imprisoned in its harbours by thick ice. Political circumstances did not allow any active participation on its part in the war to be foreseen; it was only equipped for a single cruise of the ordinary kind, and its resources, in any case, would but suffice to recruit the detachments of seamen required on the Danube. In the Black Sea there were only circular ironclads, intended especially for coast defence, some old lightly-armed corvettes, and a few steamers, to which were added vessels of high speed belonging to the Russian Company. The latter craft were armed with guns, furnished with torpedoes, and converted into a special type of vessel for active defence. Amongst them were the Emperor's yacht "Livadia," the "Elborous," the "Eriklike," the "Argonaute," the "Vesta," the "Grand Duke Constantine," the "Vladimir," the "Rossia," &c. The command of the whole naval force in the Black Sea was entrusted to Aide-de-Camp General Arkass, who, on May 22nd (N.S.), hoisted his flag on board the "Elborous," but Rear-Admiral Tchikatcheff (of the Emperor's Household) was charged to organize, with two *Popoffkas* and some small vessels, the defence of Odessa from the sea. Also, at the end of the year 1876, some steam launches and row-boats, and everything necessary to lay down lines of torpedoes, were sent from Cronstadt to Kischeneff for the Danube. The assistance of the Roumanian flotilla, which consisted of four steamers, viz., the "Stefano-al-Mare," "Romania," "Fould-jeoul," and "Rindourika," was counted on; as also was the use of small river steamboats belonging to private persons. Such were the resources against the formidable Turkish fleet which might appear in the Black Sea, and against the Turkish Danube flotilla.

The Russian ships which, at the time mentioned, were in foreign waters, were :—at New York, Rear-Admiral J. J. Boutakoff's division, composed of the "Svetland" frigate, under the command of His Imperial Highness the Grand Duke Alexis Alexandrovitch, the corvettes "Askold" and "Bogatyr," and the clipper "Kreicer"; at San Francisco, Rear-Admiral Pousino's division, composed of the

corvette "Bayan," the clippers "Vsadnik" and "Abrek," the schooners "Vostock," "Ermak," and "Toungouse," the sloop "Hornstai," and the transport "Japonetz." In the Mediterranean were, at Spezia, the armoured frigate "Petropaulosk," and at the Piræus, the schooner "Kelasom." The clipper "Haydamak" and the sloop "Morje" were on the coast of China. None of these vessels, dispersed through different seas, could take part in the present war.

The disproportion of force indicated above being such, the part played by the Russian seamen might seem to have been necessarily a passive one; however, it was not so. Boats with steam power and oars, provided with torpedoes, soon succeeded in attaining, by a series of brilliant exploits—on May 26th, under Doubasoff and Chestakoff; on June 20th, under Novikoff and Skridloff; and June 23rd, under Novikoff, Niloff, Arens, and others—an honourable place on the Danube, and in entirely paralyzing the Turkish flotilla, which was supposed to be so formidable. At the same time the few steamers of the active defence showed how ineffective was Hobart Pacha's blockade. On May 1st, at 10 P.M., the first attack with torpedoes was made at Batoum, by the ship "Grand Duke Constantine," under the command of Lieutenant (now Captain) Makaroff, and it was followed by a series of exploits which may be compared with those of the most brilliant period of any fleet.

It is absolutely impossible to enumerate all these exploits in a short article, and it will only be stated that, on the Danube, two armoured vessels and a steamer belonging to the Turks were blown up; the destruction of one of these, the armoured vessel "Loufti-Djeli," was due to the artillerymen of the land service. The Russians also took and repaired two armoured vessels, the "Nikopol" and "Sistova." The other ships of the Turkish flotilla, intimidated by the boldness of the torpedo attacks made by the Russians, kept at the small number of fortified places still occupied by the Turks, and did not venture to risk themselves on the waters of the wide river Danube. Such, on the Danube, were the chief results of the labours of the Russian seamen, who, since the early part of June, had been placed under the command of the former Captain of the "Svetland" frigate, His Imperial Highness the Grand Duke Alexis Alexandrovitch, who had returned from America on June 13th, and had almost immediately started for the Danube. On June 13th and 27th the Russian Army crossed the Danube at two points, at Brailoff and at Zimnitza near Sistova. From that moment the position of the small Russian flotilla on the Danube was assured, and there only remained for the sailors to complete what Doubasoff, Chestakoff, and others had begun.

In the Black Sea, as has been said above, the bold incursions of the torpedo boats began on May 13th, by an attack at Batoum. Subsequently there occurred: the expedition of June 10th to Sulina, under Pouchtchine and others; the expedition of July 15th and 21st, at Kilia and on the coast of Anatolia; the gallant action on July 23rd of the "Vesta," under the command of Lieutenant (now Captain of the 1st class, and Aide-de-Camp to the Emperor) Baranoff, with a

Turkish armoured vessel at Kustendje; the expedition of August 6th of the "Constantine" and "Eriklik" to Penderaclea; the passage by the flotilla and the *Popoffkas* of the mouth of the Kilia; the torpedo attack, on August 24th, at Soukhoun (ship "Constantine"); the reconnaissance of the "Livadia" at Varna and Kavarna; the transport on September 4th, by the steamers "Vesta" and "Vladimir," of the wounded from Hagre and Hagaoute to Novo-Rossinskoe; the attack of October 8th and 9th on Sulina, blowing up of the steamer "Sulina"; the capture of a Turkish transport loaded with troops on December 25th, by the steamer "Rossia," under the command of Captain Baranoff, formerly commanding the "Vesta"; and a further attack with torpedoes made by the "Constantine" at Batoum, on December 27th.

[The sum of the purely *naval* operations mentioned in the above account amounts to the following: the destruction of one armoured river gunboat and one steamer on the Danube by torpedoes; the recovery of two abandoned Turkish armoured gunboats on the same river; a running fight between the armed steamer "Vesta" and a Turkish armoured corvette; the capture of a troop-ship; one torpedo attack in which the "Sulina" steamer was blown up; and six torpedo expeditions which seem to have been without result, none being mentioned. The strength of the Russian Navy, at the end of 1877, is given in the "Statesman's Year Book for 1878," as

I. The Baltic Fleet, consisting of 137 men-of-war, of which 27 were armoured vessels and 44 unarmoured steamers; II, the Black Sea Fleet of 31 men-of-war, comprising 2 armoured vessels and 11 unarmoured steamers; besides, III, the Caspian; and, IV, the Siberian squadrons. The Imperial Navy was commanded by 80 Flag Officers, 201 Captains, 98 Commanders, 746 Lieutenants, and 129 Midshipmen, besides the navigating, engineer, and other branches; the number of men was 25,101 (*Almanach de Gotha*). The naval expenditure (ordinary) is 25,038,381 roubles, equal to 3,500,000*l.*] *Trans.*

## THE MEDICAL DEPARTMENT IN THE FIELD.<sup>1</sup>

PROFESSOR LONGMORE is well known both in Europe and America as a writer and teacher of military surgery, he has contributed largely to the literature of the subject in the Army medical reports and elsewhere, his "Ophthalmic Manual," is well known by medical Officers as a valuable *aide-memoire*, his treatise on ambulances is perhaps one of the most exhaustive of its kind ever published, and having acted for our Government as a delegate on various occasions at foreign exhibi-

<sup>1</sup> "Gunshot Injuries, their History, Features, and Treatment," by Surgeon-General J. Longmore, C.B., F.R.C.S. London: Longmans, Green, and Co., 1877. Price 3*l.* 6*d.* Size 9" × 6" × 2". Pp. 686. Weight 2*l*bs. 15 ozs.

"Kriegs-Sanitäts Ordnung," von 10 Januar, 1878. Berlin: Mittler und Sohn. Price 5*s.* Size 9" × 6" × 1". Pp. 611. Weight  $\frac{3}{4}$  *l*b.



tions, he has had unusual opportunities for examining the equipment and organization of different continental armies. His latest work on gunshot injuries is a goodly sized volume. It must be looked upon as the outcome of more than a quarter of a century's constant study, and the ripe expression of opinions not lightly formed.

There is an idea abroad that there is nothing special in the knowledge that is required for the treatment of gunshot wounds. Professor Longmore is one of those who does not share this view, and he proves conclusively and in accordance with the dicta of such authorities as Baron Dupuytren and John Hunter, that the circumstances under which both surgeon and patient are placed during war are so widely different from what obtains in civil practice, that a careful special study and training in many subjects not required in civil life, is absolutely indispensable for those who are to be entrusted with the care of our soldiers in the field.

The work divides itself naturally into three parts; the first deals more especially with the history and treatment of gunshot wounds, the second with field hospital organization, and the last is statistical. There are eleven sections in the first part. The first two sections treat of gunshot injuries and the causes which influence their nature, character, and ultimate issues, and the means by which they are produced. The various destructive elements employed in warfare are fully described in these sections, and illustrations of the various projectiles help the reader to form a just estimate of their destroying powers, while the density, velocity, and heat in determining their effects on the human body are fully considered. The difference between the injuries caused by round and conoidal bullets is dwelt on, and the superior destructive effects of the latter especially on the bony system is graphically depicted, the true nature and cause of the so called wind contusions are explained, and what may be termed the superstition regarding the poisonous effects of gunshot wounds effectually disposed of.

Section three deals with the characteristics and distinguishing signs of gunshot wounds; it is sometimes important in medico-legal cases to ascertain in a bullet wound which is the wound respectively of inlet and exit, it is not always easy to decide this point, and the circumstances which may determine a difference in the guiding marks are fully detailed.

If there be one thing more important than another in insuring the successful treatment of gunshot injuries, it is a due appreciation of the conditions of the tracks in the different parts of the body, caused by the passage of various missiles; the subject has received the full discussion that it deserves. Under Section four are considered the primary symptoms, and complications of gunshot wounds under which heads come pain, shock, primary hæmorrhage, and the lodgment and concealment of foreign bodies. With regard to primary hæmorrhage there is no doubt but that cases of this nature requiring the application of a tourniquet on the battle-field very seldom come within the observation of the military surgeon. Professor Longmore deals very cautiously with the question, but the foregoing is the general experience of

military surgeons, and does not accord with the popular notion, which is widely spread, especially at the present time when so many persons are taught the means of affording aid to the wounded, the first idea seems to be, when there is hæmorrhage from a wound in the extremities, to immediately restrain the bleeding by a tourniquet improvised or otherwise placed on the main artery of the limb, quite forgetting that pressure exerted with a firm well applied pad on the wound will generally suffice for the control of the comparatively slight hæmorrhage that usually occurs. A misapplied tourniquet, under certain circumstances, may cause the greatest mischief. While alluding to this point it may be observed that in a circular issued from the American War Office in 1865, it is stated that "The dread of "primary hæmorrhage on the battle-field is confined to the inexperienced."

Every military surgeon of experience in the field can call to mind the many cases he must have met with of the curious positions in which bullets have been lodged, and the strange foreign bodies carried with them into the body, and what difficulties they have caused, the patient himself oftentimes unconsciously deceiving the surgeon; the latter will also recollect the multiplicity of wounds made by one missile, and which sometimes is not a little puzzling.

In Section five Professor Longmore dwells on the information that may be derived from a minute examination of the clothing and the bullet. There are sometimes doubtful cases which require for their solution all the skill, experience, and jurisprudence element in the mind of the surgeon, and a typical case is narrated, namely, where the position of a single hair, rightly interpreted, drew the quick-witted surgeon to infer that a bullet was lodged in a certain position in the forehead, the inference was correct. The bullet was extracted, and, still better, the patient recovered, when his case appeared almost hopeless, and he afterwards was able to perform his duties as a cavalry soldier.

In the sixth section all the secondary complications of gunshot injuries are fully treated, such as those fell diseases of war hospitals, hospital gangrene, pyæmia, and tetanus. These are the great enemies of the military surgeon, and too often nullify all his laborious exertions for the wounded. The complication known as secondary hæmorrhage, the invasion of wounds by maggots, erysipelas, and traumatic delirium receive their due share of notice.

The general treatment of gunshot wounds occupies the eighth section. In this, as well as in the seven preceding sections, the student will find full and satisfactory information, consult them on what subjects he will, in connection with the principles of military surgery. Cases are given which bring each point forcibly home to the mind and impresses it on the memory, which is still further aided by many well-executed illustrations. Injuries incidental to special tissues of the body and their treatment are not included, but will, we learn from the preface, form a separate treatise, to be issued on a future occasion.

Any lingering doubt that might yet exist regarding the inapplicability of the regimental system for modern warfare must be dispelled by the

perusal of the second part of Professor Longmore's work, especially when studied in conjunction with the Field Hospital Regulations issued with Army Circulars, 1st January, 1878, in which the duty and responsibility of each one concerned is detailed and full information given regarding the *personnel* and the equipment apportioned to regiments and to the bearer column, and field hospitals of an army corps, and the method of packing the various waggons. It is very satisfactory to hear that the latter with their equipment, surgical and otherwise, are not merely on paper, but that the waggons are actually built, and the contents ready to be packed at a moment's notice. It is well known that all the surgical equipment, with the exception of perishable stores, is kept in readiness in Germany for each army corps at its headquarters. We have been behindhand hitherto in this matter, but now this is all changed, and no past time has seen the Army Medical Department, as regards equipment, better prepared for eventualities than it is at present, from the first dressing which is required for the soldier on the field to the arrangement for the hospital ships that will bear him sick or wounded to his home. It is to be noticed that, although the organization is very similar to the Germans, which proved so successful in the Franco-German War of 1870-71, the German model has not been slavishly followed. The duties of the respective Officers of our bearer companies and field hospitals are arranged on a much simpler plan, and more in consonance with the English service.

On referring to the most recent German regulations regarding the sanitary detachment, the analogue of our bearer company, it appears that the former is still commanded by a combatant Officer; this is a decided mistake; it leads to no end of jealousy, and, in our experience, is a source of inefficiency; to place a combatant Officer in command of a detachment of medical Officers and their subordinates employed in purely surgical work, is to place him in an anomalous position, and is a blot on the otherwise excellent medical organization of the Germans. This will be fully apparent to any one who reads the elaborate regulations concerning the respective responsibilities of the combatant Officer and the chief surgeon in a sanitary detachment. Divided authority means failure. What makes the German system to appear more inconsistent on this point is, that the *Overstabsarzt*, or Surgeon-Major, in charge of a field hospital is the commanding Officer; and how well the field hospitals of the German Army did their work in the war of 1870-71 is a matter of history. In the Austro-Prussian War of 1866 there was a combatant Officer in charge of each field hospital, but the system worked so badly that it was altered after that campaign.

There was in our Service a tradition, now happily passing away, that a good medical Officer was unfit for anything except purely professional work, and the better the surgeon the less fit he was to undertake any other duty. Men of all professions, excepting of course the clergy, and from all ranks possessing the necessary capacity and education, were considered fit to command volunteers. The Commissariat Department could exercise the necessary authority over their men; the Medical Department alone was denied this privilege. The more enlightened system that now obtains is to make the medical



Officer responsible; there is now no go-between him and the hospital servants acting under him; he is at length unfettered in the discharge of his duties in his hospital, with his bearer company, or when he is doing duty with a regiment. A further relief has been afforded: by the new organization the medical Officer is not hampered by the charge of stores; these are drawn and accounted for by the Officers of the Army Hospital Corps, the medical Officer seeing that they are according to regulations, and kept in good order; thus he will be able to attend to his professional duties, and superintend the Army Hospital Corps in theirs, without his time being frittered away in quartermaster's and accountant's work, and with a corresponding gain to the soldier, the public, and himself. To secure the success of this new organization, the Service must have a class of medical Officers of high ability, recruited from good men from our best schools.

What the qualifications of a military surgeon should be are graphically described by Professor Longmore in the following abstract, which must be given *in extenso* :—

“The Army medical Officers require various qualifications to enable them to discharge their functions in a satisfactory manner. The executive medical Officer should be prepared to practise all branches of medicine and surgery. The special divisions of surgical and medical science, and the particular applications to certain subjects, to which practitioners in civil life devote themselves, are altogether inadmissible in military practice. The Army surgeon must comprehend in his range the whole sphere of professional science and practice. He must, in addition, possess a variety of other knowledge peculiar to army practice, in order to be a thoroughly efficient Officer. He ought to be acquainted with the science and application of hygiene as regards bodies of men in all climates, the preparation of various technical returns and reports, and the nature and uses of all the articles comprised under the general terms of field, medical, surgical, and transport equipment. The Army Regulations bearing upon the management of patients in general hospitals and on field service, and those upon his own relations to other Officers and other departments of the military service, should be all familiar to him. Certain physical qualifications are also of essential importance to the Army surgeon. He should have a healthy and robust constitution, in order to resist effectually the exposure and various trying circumstances incidental to military life in general, and especially to campaigning. Moral qualities, to ensure him due respect from those with whom he is associated, and to procure the esteem and confidence of the troops placed in his charge, should also not be wanting. The administrative medical Officers should have passed through the grades of executive Officers, and should have proved their superiority by the possession of special scientific, moral, and physical qualifications while in those grades. In addition, the Officers selected for administrative appointments should have shown themselves prudent, sagacious, capable of dealing with sudden emergencies promptly, and thoroughly imbued with habits of military discipline. It is equally true of medical as of combatant Officers, those who have

“conducted themselves best in subordinate positions will almost always conduct themselves best also when placed in superior positions. Circumspection, the ability and decision of character which will impress the higher military authorities with respect for opinions and advice; the administrative tact, in addition, which will procure willing obedience and excite professional zeal among the executive Officers and departmental functionaries under their administration; these are the qualities which will mark the most successful administrative Officer of the Army medical service.”

It would be foreign to this review to detail a scheme which, if adopted, would hold out sufficient inducements for candidates who would in due course develop into the typical military surgeon just sketched, but it may be mentioned that it is a question, in a great measure, of expense; and the Government will have to authorise the additional necessary expenditure if it be alive to the necessity of procuring the best medical assistance for the soldier in peace and war; it would be unwise to have a large establishment of medical Officers that would clog promotion in peace time, and be a needless expense to the nation. A comparatively small and well paid department, with a reserve, is what is required. The department can no more meet the exigencies of war of its particular branch without a reliable reserve than the Regular Army to which it belongs can do so without the Auxiliary Forces. How is this reserve to be formed? Obviously by medical Officers who have retired from the department; early retirement, with an adequate allowance, allows of a healthy flow of promotion; it kills hope in the best medical Officer that ever served his country if you cannot give him a hope of promotion to the administrative grades after 20 years' service; in fact, every year after 40 years of age passed in the executive rank renders him the less eligible to become an administrative Officer; if it be impossible to promote him, give him a sufficient inducement to retire and pass into the reserve. The Officers composing the latter, in peace time would be eligible to hold certain appointments connected with the Service, and in war time they would take charge of our districts and hospitals at home, thus completely freeing the active list for services abroad. The department would with such a good backbone be easily and satisfactorily supplemented by young surgeons desirous of being temporarily employed in the field before settling down to the practice of their profession, by affiliated Red Cross Societies, by medical Officers of Militia, by volunteer medical Officers, who would undertake the duties of Army medical Officers in station hospitals, and latterly these gentlemen have evinced a most patriotic zeal in qualifying themselves for their military duties.

In an illustration on page 463, Professor Longmore shows the relative position of the sick bearers immediately behind the fighting line, the station of first help, the collecting station for transfer to ambulance waggons, from which the wounded are consigned to the dressing station, and from thence to the field hospital. The sketch saves a world of description, and impresses the system indelibly on the mind. In the first line of assistance there is a noteworthy difference between

the German organization and our own. Every German battalion and regiment of cavalry has what is termed a medicine two-wheeled cart, with two boxes placed *dos-à-dos*, containing a few medicines, bandages, and other surgical appliances; and the regimental orderlies have knapsacks opening behind, containing materials for first dressings; these can be obtained by the surgeon, if necessary, without the orderly taking the pack off. Stretchers jointed in the centre, so as to admit of folding, are carried on the cart which follows immediately in rear of the battalion. With us there are two field-companions for each regiment, and the stretchers, one for each company, are carried on the regimental transport waggon. The Germans lay considerable stress on regimental bandaging-places and the activity of regimental surgeons with bearer companies, while we rather insist on the regimental surgeon not undertaking any work that could possibly prevent their keeping up with their corps. Although the Germans are so amply provided for regimental assistance, on the other hand it has been repeatedly stated by the most competent authorities that the British field-companion is the most perfect equipment of its size for temporary regimental assistance; and the lately-introduced field-case of instruments, with chloroform, &c., weighing only four pounds and a half, amply provides for any operation which cannot be delayed. The case can be easily carried by every medical Officer doing duty with a regiment, either slung from the shoulder, or still better attached by D's from the saddle. Our weak point is that the stretchers have to be taken before an action from the regimental transport waggon, which may be some distance away, but this could not be avoided in the absence of a regimental surgical cart. In our field hospital regulations a provision is made for the supply of medical equipment in case of a brigade or one or two regiments being detached for duty away from the division where there might be a difficulty of a section of the bearer company acting. A distinguished Surgeon-General of the German Army considers our field panniers as the very best equipment ever designed, for such a purpose it would indeed be impossible to devise anything better.

In modern warfare the duties of medical Officers in charge of corps, whether on the line of march or in camp or quarters, are chiefly sanitary; and very important these duties are in keeping the troops in a good hygienic condition. In an action, especially a hotly-contested one, a great deal depends on the activity of the bearer companies; the medical Officers belonging to them should be young, active, and able to withstand any amount of fatigue, and two or three in each company should be expert operators. The prospects of ultimate recovery of wounded depend, in a great measure, on the skilful performance of operations that admit of no delay, the sustenance afforded immediately after an action, and the rapidity of transfer to the field hospitals in the rear; the carrying out of these duties all appertain to the bearer companies. The terrible thirst of the wounded has not been forgotten. Water tins are carried by the bearers; there are two water carts for each company, besides the water tank containing ten gallons below the floor of every ambulance waggon.



The qualifications of the Surgeon-Major in command of a bearer company are thus summed up by Professor Longmore:—"The Surgeon-Major in charge of a bearer company must be a disciplinarian, "active and strong, and a fearless rider. He should be gifted with "tact, discretion, and knowledge of character, that he may judiciously "guide and control the varied *personnel* concerned with his charge. "He should have a quick perception of the leading features of ground, "and some acquaintance with military exigencies, in order to dispose "of his bearers, and to establish the dressing stations with the best "advantage."

With regard to equitation, every medical Officer—no matter what his rank or position may be—should be a good horseman; medical Officers now undergo a course of instruction in horse-riding; in this, as indeed in all other matters appertaining to their new duties, medical Officers are extremely anxious to qualify themselves, by attendance at the course now so successfully carried out at Aldershot.

The Germans even in their new medical regulations direct that the first field dressing should be carried, according to the corps, in the breast pocket, the trousers, or the back pocket of the tunic; why not always secure it to the inside of the tunic on left side of the chest? Charpie has not yet been discarded by the Germans as one of the constituents of the dressing; when it is considered from what and how charpie is prepared, it must be considered as most objectionable. Professor Esmarch, in his proposed first dressing, has substituted cotton wool.

On page 505 of Professor Longmore's book, there is a drawing of an orderly with pouches containing a few medicines, and a bag of dressing materials, attached to the waist-belt in front. This arrangement has been found inconvenient when an orderly is employed in carrying wounded, and in the new regulations it will be seen that a waterproof haversack, with the necessary surgical equipment, has been substituted; it is suspended by means of a broad woven belt from the right shoulder.

The Germans have introduced a novelty regarding the cards to be attached to the wounded (corresponding with our diagnosis tickets); white tickets are used for those who require immediate treatment in the field hospitals, and red for those who, from the nature of their wounds, are capable of bearing, without injury, further transport to the rear; it is also to be noted that the regimental bearers no longer wear the Geneva badge, but are distinguished by a red band encircling the left upper arm, as in future, during an engagement, the British Army Medical Department would be at once recognised by the Geneva badge on the left arm, there will no longer exist any necessity for medical Officers to be marked by funereal trappings in order that they may be distinguished from other officers.

German medical Officers wear the *pickel-haube*, the usual head-dress of the Army; for instance, the Surgeon-General of an army wears precisely the same helmet as a General Officer, and indeed may rank as a Lieutenant-General—a rank not as yet accorded to medical Officers in our service.

A very necessary step will be for medical Officers, the Army Hospital Corps, and sick bearers, to be clothed in the same uniform; the absurdity of having a department, when appearing on parade, clad in two if not three different kinds of dress, has been very apparent, and has given rise to much comment; further, as the department is now a consolidated body, it should bear a name that will include all its component parts.

A great boon given to medical Officers in the field is, that they are all to be mounted; it is absolutely necessary that a horse and saddlery should be provided. An unmounted medical Officer will soon break down in a campaign.

With regard to the conveyance of wounded by bearer companies, we have the mule litters and cacolets, so suitable for the mountainous warfare that England is so often engaged in. The ten ambulance waggons of the first line, with each of the bearer companies, will always be of service pattern, so indeed should the twenty-three of the second line be, and for very obvious reasons; the latest made ambulance waggons are very elaborate and of beautiful workmanship, but their weight appears to be very great, 18 cwt. against 13 cwt. of the old pattern; the latter waggons were equirota, the fore wheels in the new ambulance waggon turn underneath the waggon, and it is a decided advantage their doing so; but they are considered by some to be too small, and therefore apt to stick in mud; there is one point very certain, that two horses will never be able to drag the waggon any considerable distance when filled with wounded on heavy roads.

All English field stretchers are now made with rollers of gun-metal attached to the feet. This provision will obviate the necessity of transferring the wounded at the collecting station from one stretcher to another. The principle is a sound one, but the stretcher requires a better plan for securing the stability of the legs when under the rough usage it must necessarily meet with in the field. The traverses are cumbersome and unnecessarily heavy.

The Germans have considerably improved their ambulance waggons. Since the war of 1871-72 the huge leathern coupé has been discarded, the front and hind wheels are nearer to one another, thus improving the draught. It would be interesting to ascertain what the weight is, and compare it with that of the English waggon. It is drawn by two horses.

The two-wheeled stretcher, shown on page 539 of Professor Longmore's work, is a capital hand vehicle for police and railway stations for conveyance in cases of accident. Although carried on the roofs of many ambulance waggons by the Prussians, we do not remember a single instance in which they were used through the Franco-German War. The only place that the wheeled stretcher can possibly be of any use in the field is at a base hospital, and that only seldom. Unlike the Germans we have no special surgery waggon with compartments for the bearer companies; with us the necessary surgical appliances are contained in light panniers of special make—wicker-work covered with hide—which have rollers of gun-metal underneath,

and are carried with an operating table and tent in a very light four-wheeled spring waggon—two-horsed. There is also in the panniers, besides surgical material, a few cooking utensils, and means of affording temporary sustenance to the wounded after an action. In less than two minutes all the panniers can be taken from the waggon, and arranged in proper form at the dressing station. The contents of the waggon weigh about 14 cwt.

Taking into consideration the great difficulty that exists of affording sufficient sustenance to the wounded after a battle, there is one improvement in the equipment of a bearer company which suggests itself, namely, that it would be well if the space occupied by cooking utensils was given up to additional medical comforts, other means of cooking being provided; and nothing appears so adapted for this purpose as the Swedish two-wheeled cooking cart, which was used in the Roumanian field hospitals at the siege of Plevna, by means of which food was prepared for many thousand sick and wounded Turks after the surrender of that town; the extreme facility of cooking extemporaneously by means of this cart is well known, and though objections will be raised as regards the multiplying of carriages with the necessary drivers and horses, still the end in view is so important that it should counterbalance other considerations.

The proper method of carrying wounded has been detailed with the greatest minuteness by Professor Longmore; our sick bearers being obtained from the Reserve, and, therefore, being already drilled soldiers, from four to five weeks is only required to make them perfect in their bearer company duties.

Leaving the bearer companies we come to the second line of assistance—the twelve field hospitals moving with an army corps, two attached to each division, two to corps troops, and the remainder in reserve. Both the Germans and ourselves have special pharmacy waggons for field hospitals. The English pattern (two for each hospital) is admirably and ingeniously fitted; if it has a fault it is that it is almost too elaborate for the second line of assistance. The waggon has also been considered to be rather heavy, but a field hospital is not moved every day, and this fact meets the difficulty. The utensils in the four field hospital store waggons, belonging to each hospital, could scarcely be reduced in number without sacrificing efficiency, and the equipment has been exceedingly well chosen.

The tentage accommodation for patients in each field hospital consist of fifty circular tents with higher walls than the ordinary bell tents, each tent accommodating four men. These tents have, no doubt, been chosen, not because they are the most suitable shelter for the sick and wounded, but because they are the best available pattern for movable field hospitals; they possess a decided advantage in the ease with which they can be pitched and struck, besides the tentage accommodation can be readily measured according to the requirements of the wounded, and segregation easily obtained for infectious cases.

The thirteen stationary field hospitals along the lines of communication and at the base of operation, constituting the third line of assistance, have no special waggons; but the equipment would be



essentially of the same kind as for movable hospitals, except that hospital clothing and other articles could be supplied in much larger quantities, as there would be no restriction on account of construction or number of waggons.

In these stationary hospitals it is directed that hospital marquees are to be used when buildings and huts are not available. The English hospital marquee is noted for its comfort, and the great protection it affords against the weather. The drawbacks are its great bulk and weight. By far the best hospital tent, combining stability with comfort, lightness, and cheapness, appears to be the Austrian marquee, which proved of the greatest value during the inclement weather in the East in the Russo-Turkish War.

The German hospital tent, in their new regulations, is of the same pattern as in the old; with its iron rods, curtains, and other complications, it must be exceedingly heavy, difficult to pitch, and, if any of the ironwork be broken, the tent must be rendered useless. In the Franco-German War, it was never used in the active operations in the front.

A suitable bedstead for the sick and wounded in the field is evidently a problem not easily solved. The Germans gave directions for making simple bedsteads from planking and lengths of wood, and constructed according to the plans given; they were of great service in 1873-74, in Orleans, Meung, Le Mans, Chartres, and other towns where stationary hospitals were established, and, being inexpensive, medical Officers had no compunction in converting them into firewood, after being occupied by infectious cases.

A capital bed for field hospitals consists of canvas sacking stretched between two poles and stuffed with straw or hay, the ends of the poles pass through holes in a wooden crossbar, supported on two stout legs, eighteen inches high; the crossbar and legs are all in one piece. All these stretchers being similar in construction, if a component part be lost, there is no difficulty in supplying the deficiency.

These bedsteads were used for weeks together in the field, in cases of severe diseases and serious operations during the Eastern War, and most comfortable accommodation they afforded for the sick and wounded. It is to be noted that, by a simple arrangement in the sacking, an excellent pillow could be formed.

Hospital railway waggons bear the same relation to a continental Army as hospital ships do to our Service, and in the German regulations the fitting equipment, *personnel*, and conduct of these sanitary trains, as they are called, are fully entered into, and plans of the waggons for cooking and conveyance of the sick are given; with us, the transport by rail would be amply provided for by extemporised means, as in the well-known Zavodovsky system in the East. During the war, ordinary trains were easily fitted up with what was required, and they answered exceedingly well on short journeys, a provision for which would only be required by an English force landing on the Continent. As to our hospital ships, one of which is appointed for each division, with a store ship attached, nothing need be said further than that a reference to the Army Medical Reports will show how excellent, of

late years, all arrangements under this head have been, and as Professor Longmore has justly remarked, the well-known "Victor Emanuel" will in future be the type of our hospital ships.

Seventy-five pages of the new German regulations are devoted to sanitary service in the field—food, water, clothing, care of the troops on the march, in cantonments, quarters in hospital, on railways, and on the field of battle—are treated, while guiding directions are given with regard to the prevention and spread of Army diseases, including the mode of disinfecting, the erection and appropriation of tents and huts for the sick and wounded, as well as ready methods for the analysis of water in the field; all these subjects are very carefully worked out. They are familiar to everyone who has gone through the course at Netley, and any information not detailed in our sanitary regulations will be found in that literary mine of sanitary science—the work of the great apostle of modern military hygiene—the late and revered Professor Parkes. The tenth section of Professor Longmore's book deals with the classification of gunshot wounds, and the eleventh or last is statistical. Statistics on gunshot wounds are like statistics on many other subjects, they are interesting on many points to the student, but are not of much assistance as forming the basis of a system. Every campaign, nay, every engagement, has its own peculiar features, which modify the number of killed and wounded, the nature of the wounds, and the part of the body which will suffer most; for instance, no two tables given will, when compared, show the relative destructive effects of the round and conoidal bullet, although we are aware, of course, that the latter is the more destructive missile of the two.

Imperfect as the foregoing review may be, it must end here, as the limits assigned have already been transgressed, but it is hoped that enough has been written to show that we are keeping pace with the increased requirements of the sick and wounded in modern warfare, and in some respects, indeed, are in advance of continental nations. What adds immensely to the difficulty in making suitable provision in our case is that England must be prepared for war in any quarter of the globe, where her world-wide interests require it.

Day by day, step by step, for the last four years, improvements have been made, and are still progressing under the present Army medical administration; there has been no swerving from the object ever kept in view, namely, the efficiency of the department, and it is a heartfelt wish that the day is not far off when the medical Officer, ever present with the soldier in health, in disease, on the field of battle, and in all climates, will belong to a united, contented, and much sought-after service, which, with its reserve, will be linked with militia and volunteer medical Officers, thus constituting a medical force that will be equal to any contingency, should England unhappily be engaged in a great war.

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## RUSSIAN TORPEDOES ON THE DANUBE AT SULINA, AND AT BATOUM.

Translated from the *Revue Maritime et Coloniale*, April, 1878, by  
Lieut. J. MERYON, R.N.

THE Russians have until now employed spar, towing, and locomotive torpedoes with varying success.

We shall describe, from their own reports, the acts of war in which these engines have been called into play; but we should have wished to have also had the Turkish reports, in order to compare the two versions and to better understand the causes of the results. At the same time, the affair at Seifé appears so clear in the Russian reports that we can but think it occurred pretty nearly as described by Lieutenant Doubasoff and the newspapers of his country. We have carefully collected all the technical accounts, but they are often wanting in details.

### *1st. Night affair of the 12th-13th May, 1877.*

The first attack which the Russians undertook with torpedoes against the Turkish fleet took place on the night of the 12th-13th May, at Batoum.

They had armed, for this purpose, a ship of the Maritime Company of Odessa. This was the "Grand Duke Constantine," which we shall frequently hear of again during this war, where she was commanded by Lieutenant (*Lieutenant de vaisseau*) Makaroff, soon after promoted to Commander (*Capitaine-Lieutenant*).

The "Constantine" was an iron screw steamer, of moderate value. She did not steam more than 10 knots an hour; her crew consisted of 150 men and 4 Officers, without counting the pilot, engineer, and doctor. Armed with torpedoes and four 4-pounders, she was arranged to hoist to her davits four fast torpedo-boats—the "Tchesmé," "Sinope," "Navarino," and the "Soukhum Kalé." The "Constantine" left the anchorage of Sebastopol on the evening of the 10th of May, with the intention of blowing up some Turkish men-of-war at Batoum. Makaroff, in his enterprise, boldly hoped to avoid, during daylight, the Ottoman squadron, thinking that he would be able to see them before they could see him, owing to the thick smoke of the English coal used by his enemies; and, as he carried no lights, he counted, also, on avoiding them at night, since the Turks, manœuvring as a squadron, were obliged to carry them.

We shall hence see him three times able to deceive and surprise the enemy.

Arriving on the morning of the 12th in sight of land, the "Constantine" entered Poti at daybreak, and left this anchorage in the evening for Batoum. At 10 P.M. she was off the roadstead at seven miles distance. She dispatched her four boats, which were each commanded by an Officer, Makaroff himself taking charge of one of them.



These boats, well built, painted sea green, possess a high speed, obey their helms well, do not betray their approach, and, by their small size, are bad targets for artillery. When the boats left, it was agreed that the "Constantine" should not wait for them if they were observed before arriving at their destination, and that they should regain Poti to the best of their ability.

However, they arrived happily in the roads, and the "Tchesmé," commanded by Lieutenant Zatzarennyi, which was two or three cables ahead of the others, first came across a Turkish ironclad frigate, which was stationed as guard ship. Zatzarennyi had a towing torpedo, which he was able to place right under the stern of the ironclad, but the explosion did not take place when the electric firing-key was pressed. It appeared that the wires were foul of the screw of the torpedo-boat, and that most probably some of the insulation was stripped off. The Turks, having at last taken the alarm, began firing from the shore and from the fleet, but the boats received no harm; however, two of them, of which Makaroff's was one, endeavoured to regain the "Constantine." As to the "Tchesmé" and the "Sinope," they succeeded, after making several *détours*, in reaching Poti. Although this first endeavour was unsuccessful, the authors of it were received at Sebastopol with enthusiasm, when the "Constantine" returned there on the 15th May.

*2nd. Night affair of the 25th-26th May.*

In this extremely interesting affair, the Russian steam boats, armed with spar torpedoes, attacked a Turkish squadron of three ships, and sank one of them.

During the night of the 24th-25th May, Lieutenant Doubasoff anchored at Braila, made a reconnaissance, to assure himself of the relative positions of the Turkish ships—the "Fet-ul-Islam," the "Seifé," and the "Kilidj-Ali," an ordinary two-funnelled steamer. The distance from Brailoff to Matchin, as the crow flies, is seven or eight miles. One would think that the Turks were aware of Doubasoff's movement, since, although they did not take all the required precautions, yet they changed their anchorage on the evening of the 25th, and we shall see that they were not taken unawares.

The night of the 25th was rainy, but not completely dark, since the moon was above the horizon during nearly the whole of the expedition.

At one o'clock in the morning the Russian column left Brailoff; it was composed of four boats. 1st. The "Czarowitch," commanded by Doubasoff, who also commanded the expedition, with Major Roumain Mourjesko and 14 seamen. 2nd. The "Xénie," commanded by Lieutenant Chestakoff, with Lieutenant Petroff as a volunteer, and 9 seamen. 3rd. The "Djiquite," with Midshipman Persine and 8 seamen. 4th. The "Czarevna," Midshipman Bali and 9 seamen.

They left Brailoff in single column, in the above order, at 45 yards distance apart; they followed the coast until they saw the enemy through the mist, when they took the middle of the river, and took station in two columns, the "Czarowitch" and the "Xénie" ahead, the "Djiquite" and the "Czarevna" in the second line. They eased

speed at the same time, to stop, as much as possible, the noise of the engines and the water.

There was also a light wind from the north-west, which was towards the enemy, and might betray the approach of the Russians.

Before leaving, Doubasoff had arranged the following plan of attack. He was to attack first, Chestakoff to support him, Persine to pick them up, if they came to grief, and Bali to remain in reserve. If the first attack sunk one of the Turkish ships, Chestakoff was to attack the second, Persine would support him, Bali was to be ready to come to their aid, Doubasoff holding himself in reserve; and so on again.

The enemy presented themselves thus:—the “Seifé” in the middle, the “Fet-ul-Islam” on the right and ahead, and the “Kilidj-Ali” on the left. It was half-past two, the boats were going slowly, without any noise, with the exception of Doubasoff’s, which gave him much trouble. The waste steam goes either into the condenser, whence it feeds the boiler, or into the funnel to increase the draught, producing a well-known noise at each stroke of the engines; if they stopped the blast the noise ceased, but the pressure of steam fell rapidly; they were, therefore, obliged to stop the engines while the pressure was got up again, if they did not wish to make a noise.

Four times Doubasoff, who saw the enemy, was obliged to stop to avoid being heard; stemming the current, which is strong at this part of the river, he could but go very slowly; he had taken an hour and a half to do the eight miles which separated Brailoff from the scene of action. The pressure in his boilers, which should have been from 3 to 4 atmospheres (45 to 60 lbs.) fell to 2 atmospheres (30 lbs.) when the draught ceased.

At last, arriving at about 135 yards from the enemy, Doubasoff turned on his blast, stoked up his fires, and, warning Chestakoff that he was going to begin the attack, steered for the “Seifé.”

At about 65 yards from this ship, the hail of the Turkish sentry was heard. “Seni Adam!” replied at all hazards Doubasoff, instead of “Sizgyn Adam!” (one of your men) which even would have been a wrong reply, for, to the Turkish hail, “Kymm dyv ô!” the proper answer is, “Janandji deil!” (I am not a stranger).

Doubasoff’s reply had betrayed him; the Turks were on their guard, for the sentry fired his rifle, which was repeated from other parts of the neighbouring ships. The captain of the gun (9-in.) was smartly on his tube laniard, and three successive miss-fires were heard. Disorder spread over the “Seifé;” the men ran hurriedly on deck, firing here, there, and everywhere; the crews of the turret guns, which commanded the deck, rushed to their posts, and, during this time, Doubasoff’s boat was approaching. Sixty yards are quickly passed over, though deducting the current, he was hardly steaming four knots an hour.

He steered for the port deck houses, so as to shelter himself from the fire of the after guns, as well as, as much as possible, from that of the turret guns, wishing by this to strike the screw and the rudder, in order to render the “Seifé” inactive, she being under steam.

“I directed,” says he, “the blow of my torpedo, placed on a straight

"spar ahead of the boat, a little forward the port deck houses, that is, a little nearer the centre of the ship. I ordered the automatic firing-gear to be joined up, to have the firing-key in hand, and to be ready to complete the circuit at an instant. The explosion followed the automatic closing of the circuit, and the torpedo evidently struck the vital parts near the keel, just ahead of the stern post. The shape of the submerged part of the stern of the monitor evidently increased the outrush of the column of water, and this column filled the boat. A black column of smoke and *débris* raised itself to a height of about 120 feet, the ruined scraps of the ship's fittings falling into the boat attested that the gas had passed through the bottom and decks of the ship."

The afterpart of the monitor had suffered considerably; her displacement began to change, and the crew collected forward.

At the same instant, on board the torpedo boat, Doubasoff believed that his own craft was sinking, and ordered the stokers to leave their posts, to come out from behind the shields, and to throw themselves into the water to get on board the "Djiquite." Luckily his coxswain, an old seaman, Kisloff, called out that the draught of water was not changing, that she was not sinking, and Doubasoff, told of his error, set his crew to work to bale out the water; went astern full speed, and ordered his bilge-pump to be set to work. The Turks, however, had got their turret guns into action, fired them, and poured on the boats a fire of musketry; if the "Seifé" was going down, it was evidently very slowly, for ten minutes after the first explosion, Doubasoff, who was trying to disengage himself, called to Chestakoff—"Chestakoff! Come on!" It was time, for already the port turret gun had fired two shots, and it only wanted one lucky shot to sink the "Czarowitch" as well as the "Xénie." Chestakoff, steaming ahead at full speed, placed his torpedo nearly opposite and a little abaft the turret.

"Exploding his torpedo at will," said Doubasoff, "he placed it apparently under the very keel of the 'Seifé,' and the torpedo, being at a distance of  $19\frac{1}{2}$  feet from the stem of the boat, was just under the centre of the beam of the ship. The result of the explosion was an evolution of gas, as strong as in the previous case. We saw a cabin door fall behind the stern of the 'Xénie.'" The monitor from then ceased her artillery fire; although sinking, she kept up her rifle fire. During this time, Doubasoff, who was occupied baling out water by hand, his pump not working, drifted down stream carried by the current. As to Chestakoff, his screw was foul in the wreck, and he had to clear himself along the whole length of the monitor, while his riflemen replied to the fire of the enemy almost within pistol shot. At last clear, Chestakoff, in his turn, let himself drift. The "Djiquite" received a bullet in her stern, which obliged her to run on shore to stop the leak; her screw got foul of the weeds, and she was some time before she could be got afloat.

Meanwhile the day was breaking, and even distant objects began to be visible, the fire of the two Turkish ships afloat increased; it was necessary to retire. Hence as soon as the four boats were in a condition to be managed, Doubasoff returned with them to Brailoff.



The Russians allowed to neither killed or wounded.

The affair lasted about twenty minutes. One may ask what the other two Turkish ships were doing; according to the Russian reports, they were both in a position to fire. They declare that the projectiles from the Turkish guns, firing from their decks, passed generally over their heads. It is probable that the alarm spread by the torpedoes exploding so close to these ships may well have hindered their movements, and that they were principally occupied with their own defence. Doubasoff thinks that there was bad feeling amongst the Turks. He praises the coolness and courage of his subordinates; he says that no cry was made, and that silence was observed and only interrupted by a ringing cheer when the monitor sank. By that time the boats ought to have been far enough away.

The Grand Duke Nicholas immediately decorated Doubasoff and Chestakoff with the 4th class of the Cross of Saint George. A seaman torpedoist, an engine-room artificer, and a stoker, received the insignia of the Order of Military Merit.

The two seamen who exploded the torpedoes had passed through the Russian torpedo school, and had served four months in the instruction ships "Izoumrood" and "Tcharodaika." The accounts in the European papers were very diverse. The *Standard* of the 28th May represented that floating torpedoes of dynamite had been placed across the stern of the monitor, and that the wires had been led to the shore, where they were brought together to pass the electric current. The same number gave another account more nearly approaching the truth. The *Times* of the 28th says that it was one of the bravest deeds in the history of the war. On the 4th June it pretended that the Russians were dressed as Turks, and had talked with them while placing the torpedoes.

Finally, Arifi Pacha, in a report to his Government, believed that the "Seifé" was sunk from the effect of two Whitehead torpedoes.

### *3rd. Night affair of 10th-11th June, at Sulina.*

On the 28th June the Russian steamer "Grand Duke Constantine," commanded by Lieutenant Makaroff, left Odessa at 1 P.M. She had in tow, and hoisted up, six steam boats armed with torpedoes.

After her, the "Vladimir" left at seven in the evening to support her in case of necessity. The object of the expedition was not known until out of sight of land; when the boats were told that they had to blow up four Turkish ships, of which three were ironclads, anchored off the Sulina mouth. They were the "Fethi-Boulend," the "Idjalie," and the "Mouhadem-Khair" the fourth unarmoured was the "Kar-tall." The Russian boats were divided into two groups. The first, which was towed, consisted of boats No. 1 and No. 2, and the "Tchesmé." The two first had spar torpedoes, and the third a towing torpedo. The No. 2 was a very large boat, 68 feet long. She was commanded by Lieutenant Rojdestvenski; the No. 1 was under the orders of Lieutenant Poustchine, and the "Tchesmé" under those of Lieutenant Zatzarenni, who, the previous month, had directed near Batoum a torpedo attack against a Turkish frigate. The "Constantine" arrived before

midnight near the Isle of Serpents (Fidoni) situated 26 miles east of the Kilia and Sulina mouths, remained there several hours, but not meeting, as she had hoped, the Turkish ironclads, continued her voyage towards Sulina; at half-past one, Makaroff stopped again, and gave the boats, in a loud voice, the following orders:—"We are six miles from the Sulina Roads; let go the tow, and try to find the Turkish ships. If, after going five miles, you see nothing, pass to starboard off the Sulina lighthouse, and steer to the northward, five miles from there you will meet me. Remember this agreement. Do not separate until you see the enemy. God bless you!"

Letting go the tow, the first group formed line abreast, the boats keeping close together went ahead. The "Tchesmé" was in the middle. Boat No. 2 on her left, and No. 1 on her right. The working of the engines was scarcely heard, and all lights were carefully hidden with tarpaulins. After a few minutes the "Tchesmé" approached No. 2, and communicated to them, in low tones, that they had observed the enemy; she then went round to starboard, with the intention of working round the Turkish squadron, and of using her towing torpedo. Zatzarenyi got it in tow abaft his beam, but directly he began to go ahead, the conducting wires got foul of his screw; the engines stopped, and he only had time to manage to clear his propeller. It was a repetition of what had happened at Batoum; the failure of the "Tchesmé" and her fittings was evident.

Three of the Turkish ships were at anchor, with fires banked; the fourth was under weigh under steam. Lieutenants Rojdestvenski and Poustchine steered on with boats Nos. 1 and 2. The latter, which was a little ahead, steered towards her neighbour, and Poustchine said to his colleague, "Do you see a Turkish ship on the left?" On receiving an affirmative reply from Rojdestvenski, Poustchine sheered off and disappeared in the darkness. The Turkish squadron was plainly in sight, the sentries were heard challenging each other; however, the darkness was such that the "Idjalie" allowed boat No. 2 to approach within 30 yards of her before hailing and firing the first rifle shot, which raised the alarm in the other ships. These immediately commenced a general fire of artillery and musketry.

It was two o'clock in the morning. Rojdestvinski, who up till now had been steaming slowly, increased his speed so as to come up to the enemy quicker, arrived close to the beam of the "Idjalie," and when nearly touching, produced the automatic discharge of his torpedo, but it was difficult for him to judge of the result of his attack. From subsequent inquiries the "Idjalie" received probably some severe damages, but the Turks formally deny that she was placed out of action. That, however, appears to have been beyond doubt the case. It is always the case that an enormous sheaf of water is raised along the whole length of the ironclad, and falling into the boat fills the foremost compartment, where the steering gear is placed, with more than 3 feet of water. According to all accounts this wheel was near the midship part of the boat, to which its water-tight partitions afforded on this occasion good service, since this mass of water, changing the displacement of this large boat, and raising the stern,

probably permitted her more easily to clear the "crinoline" which was round the "Idjalie," as we shall see further on. At this instant the ironclad's guns opened fire, and her projectiles passed over the heads of the assailants.

The boat had at first gone astern at full speed, and, when clear of the beam, went ahead, when it was noted that the axle of the steering wheel was damaged, and that the stay was broken. To place the helm in a condition to be of use demanded all the coolness and pluck of Rojdestvenski and of the engineer, Kantzeroff, who had to come out from behind their shield, and work with their own hands to ship the fighting tiller, under a hail of bullets, whilst the seaman-torpedoist, Sokolnikoff, threw overboard the remains of the spar, and deliberately cut the wires. Besides this, a gauge glass had been broken by the explosion, and the funnel had been bent. At the same time, the Turkish ship under weigh steered towards the torpedo-boat, and threatened to chase her. Rojdestvenski's position was becoming embarrassing; bullets had pierced the sides of his boat; the pressure in the boiler had fallen; he reports that then his engineer threw 5 lbs. of salt and oakum into the fires, the pressure then immediately rose, and the Russian Lieutenant was able to rejoin the "Constantine." We think that the chase by the Turkish ship was not very seriously meant; the intense darkness, and the alarm which the unexpected attack of the Russians inspired, were not calculated to give great ardour to the pursuit.

The second group of the Russian torpedo-boats had followed up the first, but, on hearing the noise of the explosions, and perceiving that by this time the Turks were too fully alert to be surprised, they returned towards the "Constantine."

That ship, hearing the heavy gun and rifle fire, had attempted to close the land, but she grounded, and remained until daylight in a difficult position. Got afloat at last, after having thrown overboard some of her coal, she was able to pick up her boats and return to Odessa. Poustchine alone was missing. Makaroff waited for him until 8 A.M., but he was too inferior in strength to the Turks to remain longer near them. What had become of boat No. 1? The Russians were the more anxious, since they had heard a second explosion. Poustchine had come across a girdle of chains and hawsers, supported at intervals by barricoes. Charging this obstruction, he had even fired his torpedo, but with no effect. His boat, half filled with water from the explosion, was sunk by a Russian shot. In a moment, the Russians were all in the water, and Poustchine relates that he lost consciousness; when he regained it, he found himself in the hands of the Turks.

The ship which he had attacked had evidently a defensive crinoline. Rojdestvenski thinks, also, that the one with which he was engaged was similarly protected.

On the return to Odessa, he found, in fact, that his boat had a leak; and, when she was lifted, it was ascertained that she had, on the hull, in the bows, near the keel, sixteen rivets started or broken; in mid-ships, marks of having been in contact with some hard substance;



and aft, that the iron keel-plate had dropped 46 centimetres (18 inches) from the keel; and finally, that the lower part of the rudder was broken, and that one of the blades of the screw was bent aft. All these damages are perfectly explained by a defensive crinoline, over which boat No. 2 had passed and repassed. It would also account for the damage to the steering wheel; although a doubt may remain, as these damages, at least those of the rivets, were perhaps the partial effect of the explosion of the torpedo. It is true that the explosion, according to the men in the boat, was feeble; from which it may be thought that the principal effect of the explosion was spent in the extended girdle of the monitor, which the facetious editor of the *Kronstadt Messenger* nicknamed her "crinoline." He also adds, with considerable sagacity, that the authors of this affair had not probably sufficient presence of mind to give an exact account of what took place.

The Russians allow to none killed.

We will also give some Turkish accounts of this affair:—

*Telegram from Admiral Moustapha Pacha. 12th June.*

"Five fast Russian torpedo boats sent to Kilia to attack the "Idjalie," and the other Turkish ships, were received with a storm of bullets. Two boats were sunk, and the three others exploded their torpedoes, but without effect on the fleet. Some Russians have been made prisoners."

12th June.—*Extract from the Official Turkish Report of the Attack on the "Idjalie."*

"The explosion was ineffectual, owing to the clever manner of handling the ironclad. We have taken prisoners six men of the crew of the torpedo boats, and amongst them an Englishman (?)."

Rojdestvenski received the 4th class of the Cross of Saint George. Kantzeroff, Sokolnikoff, and another seaman, the insignia of the Order of Military Merit.

*4th. Day affair of 20th June.*

On the 20th June, at 3 A.M.; six Russian steam boats anchored at Maliadedjesse, left that port to place torpedoes at six miles from there, in the channel of the Danube, which at this point follows the steep bank of the Turkish shore. The river is four miles broad, and is divided into several arms, by islands covered with rushes and willow trees. The Russians were told to place the torpedoes along the two sides of a small island, about 600 yards in length.

Up till daybreak they succeeded in placing their torpedoes on the Russian bank, but directly they tried to commence operations on the Turkish shore, they were saluted with a shower of balls, to which the Russian batteries, in their turn, replied. However, a Turkish steamer came out from Rustchuk and caught the boats between two fires, which, not being able either to advance or retire, took refuge amongst the rushes of the island, exposed to the fire of the enemy; this was increased by that of a monitor, which, protected by the island, continued

the fire from its bank against the Russian batteries. It was then 8 A.M., when Captain Novikoff ordered Lieutenant Skrydloff to stop, at all hazards, the progress of the steamer. This Officer commanded the boat "Choutka," which carried a torpedo. Immediately he left the rushes at high speed, ran under a heavy artillery and rifle fire, struck with his spar the broadside of the ironclad; unhappily, the torpedo did not explode, and they found that the wires had been cut by bullets in two places. The fore part of the boat was struck by a shot, and the crew began baling out. Skrydloff succeeded in escaping, by making a large sweep down the river, and rejoined the Russian flotilla; he had been wounded in both legs, as well as a volunteer, an artist called Verechekaguine. The engines, which were evidently protected, had received a volley of musketry, but none of the crew had been touched.

The fire continued all day; the losses of the Russians were insignificant, and they profess to have succeeded in placing their torpedoes.

Nevertheless, the repulse of the "Choutka" was complete. It is astonishing that she did not suffer more loss, and that she was able to escape the Turks; evidently their fire was bad, or this audacious attack, in broad daylight, could hardly have been so nearly successful. All things considered, I do not find a sufficient clearness in the Russian report of this affair; it seems to avoid telling the whole truth. I would not answer for it that Skrydloff was really in contact with the ironclad, although his report says that he was. Anyhow, it may be asked whether the Russians would have dared to make such an attack in the face of any other adversary than a Turkish man-of-war.

#### *5th. Night affair of the 27th December.*

Poti is a small Russian port, situated a few miles north of Batoum. By reason of the form of the coast, the movements of the ships in one of the ports could be seen from the other. Hence, since the Turkish ironclads and several steamers were at Batoum, the "Constantine" had been forbidden to anchor in Poti during the daytime. Hence, when the "Constantine" arrived at Poti on the 27th, from Sebastopol, with four torpedo-boats at her davits, night had already set in. They learnt that the Turkish ironclads had just bombarded the fort of Nicolas, and ought to have returned to Batoum, or would be found in the vicinity. Makaroff immediately got ready. The night was very dark; a fine rain was falling. The swell was very low, which is a great point for using locomotive torpedoes. When arrived within four or five miles from Batoum, the "Constantine" lowered her four torpedo-boats. They were—

1st. The "Tchesmé," with a Whitehead torpedo, charged with 32 kilog. of gun-cotton, commanded by Lieutenant Zatzarenniyi, who had already been at the affair of Sulina, and the first Batoum affair, and had been decorated with the St. George's Cross;

2nd. The "Sinope," armed with a similar Whitehead torpedo, carried on a separate raft, under the orders of Lieutenant Stehelinski;

3rd. The "Souhkoum Kalé," commanded by Midshipman Nelnn-Hirs;

4th. The "Navarino," Lieutenant Vicknevetski.

The expedition was under the orders of Zatzarennyi. They left the "Constantine" at 10 P.M. Makaroff, fearing the set of the sea, had given them a course a little to windward; this they did not know, and, with the same idea, they steered yet more to windward of Batoum.

In short, it was only at midnight, after much groping about, that the boats sighted the masts of two ironclads over the long point of land which shelters the roadstead of Batoum. They rounded this point at slow speed, and found themselves in the bay.

It was owing to the night being so dark that they were enabled to approach so close without being noticed. The Russians only noticed two ships; in reality there were seven. They were moored with one anchor ahead, and their sterns hauled in to the shore; their position was not advantageous, since only one could open fire, and that only on one side; the dark mass of this one was alone open to the Russian attack, who could see behind her another, placed nearer in shore.

The Turks had taken no defensive precautions—no protection—no guard boats. The sentries called to each other by whistling, showing that they were not asleep, but hardly added to the security of the defence.

The Russian boats took this ironclad for the "Mahmoudié," which Hobart Pacha commanded, and their excitement was proportionally increased.

The "Tchesmé" and the "Sinope," being the best steamers, had gone ahead, leaving the other two in reserve; they thus arrived at a distance, estimated at from 50 to 65 yards, from the Turkish ironclad; the "Tchesmé" then fired her torpedo, the first Whitehead torpedo ever fired with an offensive object. It ran straight, leaving behind it a trail of phosphorescent foam, and struck the broadside of the ironclad between the fore and main masts.

Whilst the surprised Turks were rushing on deck and calling out, the "Sinope," in her turn, fired her Whitehead, which exploded under the enemy's stern.

The ironclad had already opened a fire of small arms, and then her broadside began to speak, but, fearing to strike their own people, they fired too high, and their shots passed over the heads of the Russians—an effect which we have noticed before.

The two boats had nothing to do but retire. They rounded the cape at high speed, the "Tchesmé," which was the best steamer, towing the "Sinope."

Before going further we will say that the result of these explosions is unknown; if it was followed by a considerable leak they were unable to beach the ironclad, because the coast at Batoum is too steep. Perhaps she was able to reach Constantinople in a sinking state. Anyway, it is evident how much more interesting from certain points of view the Turkish reports would be than the Russian. In this actual case, at a time when the merits of the Whitehead torpedo are being discussed, it would be of the greatest interest to know whether the Russian accounts are strictly correct, and if the plucky Officers who carried out the expedition were not deceived.



The two boats had scarcely gone a few cables before they perceived a steamer steering for Batoum. They naturally took her for a Turk, and had only just time to prepare their screw torpedoes (first pattern of a Whitehead torpedo). They were preparing to fire them when they heard the cry of a vigilant Russian look-out, "Who goes there?" and then recognized the "Constantine," who had come to the entrance to Batoum to look for them, and hoisted them up immediately. The reserve boats, "Navarino" and "Soukhoum Kalé," had also mistaken the "Constantine" for a Turk, and in view of this unexpected enemy had steered for Poti, where they arrived safely. The "Constantine" had made night signals to them, and waited for them until daybreak. During all this time the Turks did not move. Finally, Captain Makaroff sailed for Sebastopol, where he arrived on the morning of the 30th. His entry was greeted with loud cheers.

Captain Chardonneau, who is the author of these interesting accounts, concludes by remarking:

We think that these accounts, taken from official sources, well analysed, will be of interest to sailors. One of these recitals has been already partially published in the *Revue*, from an article in the *Times*. We have been able to correct it in some points, and to complete.

The sum total of these reports, however, does not mark any great progress on the torpedoes used in the American war.

We have not yet to hand the accounts of the same class of action which occurred between July and November, 1877, nor those of 1878, with which we have permission to compile similar accounts.

Note by the Translator.—Subsequent accounts do not verify the statements of the Russians, that the Whitehead torpedoes used at Batoum exploded, as they were both picked up on the beach afterwards.

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## THE COMBAT AT PLEVNA.<sup>1</sup>

CAPTAIN VON TROTHA has produced an exhaustive study of the operations round Plevna. Commencing with a description of the theatre of war he deals with the subject in thirteen sections, adding at the end of the greater number critical remarks. We have not space for more than the observations which form the last section of the pamphlet, but a careful examination of the whole will repay perusal, and will probably be found of considerable value to Officers who are still studying the operations of the late war. The translation has been made by Captain G. MacDonald, R.E. H.

### 1. *The Operations.*

It will never perhaps be clearly known what plan of operations the Russian autho-

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<sup>1</sup> *Der Kampf um Plevna.* Taktische Studien von THILO VON TROTHA. Pamphlet. Berlin: Mittler und Sohn. 1878. Price 3/6. Size 9" x 6" x ½". Pp. 172. Weight under 9 oz.

rities originally devised, certainly not for some time ; but whatever the original programme was, it was only carried out up to the passage of the Danube.

The comparative ease with which the passage of that river was effected, and still more, Gourko's promptly taking advantage of the situation to make a rapid advance over the Balkans, impress on the hitherto extremely cautious and methodical conduct of the campaign a quite different, we may almost say a foolhardy, character ; it gives us the impression that in the middle of July political considerations exercised a greater influence on the management of the campaign than those of a purely military nature.

An undervaluation of the foe (which was soon severely punished) led to a precipitate advance ; successes, easily won, and more apparent than real, produced a complete intoxication, which represented to the excited fancy objects as attainable, which, with the available resources certainly were not, and the reckless pursuit of which might easily have led to the most serious consequences.

It is interesting to form a general representation of the course which events would probably have taken had the interlude of Plevna not taken place.

First. It is possible that the sudden appearance of the Russians south of the Balkans might have created such consternation in Constantinople that all further resistance would have been given up, and that the way for negotiations would have been opened, not possible under the circumstances without certain sacrifices on the part of the Turks.

If Turkey then made (a purely imaginary hypothesis) extensive concessions on the basis of the Berlin Memorandum, and placed the execution of the promised reforms, to some extent, in the hands of a European Commission, Russia would have been, in a manner, disarmed. The end for which she had drawn the sword would have been attained, though perhaps only in appearance ; at this time her pacific assurances and protestations of unselfish humanity had not been washed away by countless streams of Russian blood ; as yet the just claims of Russian national feeling might have been satisfied with certain concessions of a more apparent and formal than of a real and actual nature. In a word, the solution of the Oriental question, that bugbear of the peace of Europe, might have been again postponed for a longer or shorter period. But the events associated with the name of Plevna have done away with this possibility, and have rendered the long-threatened Oriental catastrophe almost unavoidable. Herein lies the great political importance of the conflict which raged for five months round Plevna.

But there remains another alternative to be considered. The war might have been continued after the Russian passage of the Balkans, and the Russians, carried away by the excitement of their easily won preliminary successes, might have removed their scene of action, with their (as was only later established) entirely insufficient forces, beyond the Balkans.

In that case, the repulse would have taken place at Sophia or Adrianople instead of at Plevna. In view of the entirely insufficient Russian forces, and of the defensive strength of Turkey, so greatly undervalued, and in reality far surpassing all expectations, a repulse was unavoidable (quite apart from the numerous individual mistakes of the Russian leaders, which, however, were counterbalanced by at least equally serious errors on the Turkish side). This crisis would have had to be overcome, and the war in a measure started afresh. The Russians at Plevna found this difficult enough, and it cost them heavy sacrifices in money and blood, but with much longer lines of communication, and particularly with the difficult passes of the Balkans behind them, it would naturally have been far harder. It would then have been very possible that the campaign of the year 1877 might have closed with a manifest reverse to the Russian arms.

The great strategical result of the fighting round Plevna is that it opened the eyes of the Russians in time to the dangers which threatened them ; that it compelled them to make in time a suitable change of their entire plan of campaign, and that it finally forced them, against their will, in a measure, to raise the additional troops which were quite indispensable for a decisive result.

From these considerations it might be readily concluded, that as the campaign before Plevna, in spite of preliminary reverses to the Russian cause, yet eventually was productive of important advantages, and in a manner could not fail to produce

such ; it must have been an error on the part of the Turks to bring on a decisive battle at Plevna. This point requires a brief consideration.

The strategical position of the Russian Army, when Osman Pacha appeared so suddenly on its right flank, was, without doubt, unfavourable, and when Krüdener was beaten at Plevna on the 30th of July, it became in a high degree critical.

Had Osman Pacha been in a condition, immediately after this victory, to undertake an energetic pursuit, and to drive the demoralized as well as defeated troops of Krüdener back over the Osma, which, according to the numerical strength of the two armies, he would have been quite capable of doing ; all the requisite conditions would have been presented (assuming a tolerably judicious and combined employment of the southern and eastern Turkish armies) for bringing on the Russian armies a catastrophe which would have certainly decided the issue of the campaign for the year.

In this case, the original retention of the Western Army at Widdin, and its skilfully managed advance at the decisive moment, on the decisive point, would have been adduced, with a certain degree of justice, as a splendidly conceived and brilliantly successful example of strategical calculation, and the much despised and opposed "secret plan" of old Abdul Kerim (the existence of which even has been often doubted) would have found a striking justification. But this justification—the regarding of the advance of the West Bulgarian Army from Widdin to Plevna as the outcome of deep strategical reflection—is much shattered, not by the eventual want of success—this would be an unworthy criticism—but by another consideration.

If Osman's Army was to play the decisive part which we have attributed to it, this could only be done by an energetic offensive ; but Osman's inactivity, after his second victory at Plevna, on the 30th of July, proves that his Army, which had behaved so well on the defensive, was entirely wanting in any trace of offensive power ; otherwise an undeniably skilful General, like Osman Pacha, would never have failed to take advantage of such a favourable state of affairs as was presented to him in the beginning of August.

If Osman Pacha considered himself, *i.e.*, his Army, capable of carrying on energetically the offensive movement he had begun, up to a decisive battle, then his advance from Widdin to Plevna was a well planned operation ; but if he did not give his Army credit for such offensive power, his advance was a mistake. The simple holding fast of his Army to Plevna was then, in spite of all his defensive successes (partly due to the unskilfulness of the Russian leadership) not only aimless, but a voluntarily surrendered advantage to the Russians ; that they did not make use of this advantage till late and after many failures and sacrifices—even that the obstinate holding out of the Turks at Plevna nearly gave to the whole campaign a turning unfavourable to the Russians—all this lay in circumstances which were quite without the foreknowledge of Osman Pacha.

## 2. *The Fighting. Fire of Masses. Entrenchments.*

The great wars of the seventeenth and eighteenth centuries bear in a certain degree a personal character ; almost every one has its peculiar character, as far as it has one stamped on it by the individuality of one or several leaders. Of course, in course of time a succession of progressive steps have been made, partly in technical armament and equipment, partly in tactical formations and the employment of troops : but important innovations, influencing the entire mode of combat, do not appear, and so during a long period the mode of fighting remains fundamentally unchanged.

The period of the Napoleonic wars forms the transition from the above-mentioned epoch to that of modern warfare. Certainly the appearance of the dispersed order of fighting exercises a revolutionary influence on the general mode of combat ; but the arms and equipment of the infantry, cavalry, and artillery of Napoleon differed in nothing from the arms and equipment of his opponents, and apart from comparatively unimportant minutiae, hardly from the arms of the time of Frederick, of Eugene, of Turenne.

The great wars of the last five-and-twenty years present an essentially different picture ; the individuality of the leader, though naturally now as formerly decisive



of the result of the war, retires far into the background as compared with former times. On the other hand, each great war of late years is characterized by an epoch-forming step of progress in the region of armament, and by a consequent fundamental alteration in tactics.

The war of the East brought the rifled musket, the Italian War the rifled cannon, the American War armoured ships and monitors, the Prusso-Austrian War the breech-loader with moderate range and rapidity of loading, the Franco-German War the Chassepot as a far superior rival of the old breech-loader; finally, the Russo-Turkish War produced new systems outbidding each other in rapidity of fire and range, and culminating in the repeating rifle, and in connection with them the application of field fortifications on a large scale, no longer as an exception, but as a rule.

The danger of a waste of ammunition deduced as an objection by the opponents of the breech-loading system on its introduction, was happily overcome by the fire-discipline of the Prussian troops; the strikingly small expenditure of cartridges in 1866 (2,000,000) gave evident proof that the rapidity of fire of the new arm was only made use of in rare exceptional cases, and then only partially: the fire was generally delivered as aimed fire at short distances, and with very moderate rapidity.

Quite different was the use which in 1870 the French Army, not subjected to a long peace training in the use of a quick-firing and long-ranging arm, made of the Chassepot: their fire was opened at enormous distances, partly indeed without the enemy being really in sight. The latter certainly suffered hereby considerable losses, even at great distances; but a substantial result was never obtained by this sort of fire. It is not intended to enter here on the burning question of the advantages and disadvantages of mass-fire at long ranges. It may, however, be asserted that the above-mentioned practice of the French did not arise from clear reflection and calculation, but from deficient fire-discipline and from hazy ideas as to the real value of the arm.

After the Franco-German War, the employment of mass-fire at long ranges became often the subject of theoretical treatises and practical trials in the great armies of Europe, but while the arguments for and against were still being warmly debated, and while no definite decision as to the new arrangement of fire-tactics (which in any case had now become necessary) had yet been arrived at, the question was settled in Turkey out of hand without many preliminary investigations, and most important consequences were derived from the armament with long-ranging and rapidly-firing rifles.

At the commencement of the present war the Turkish Army brought out a system of fire-tactics quite complete in its simplicity, viz., as soon as the enemy was known to be within range, the ground which he was supposed to occupy, or over which he was expected to advance, was swept, without regard to distance, or to probability of hitting, or to the expenditure of cartridges, with a fire the violence and duration of which may be said to have been hitherto unheard of.

Hand in hand with these fire-tactics goes the application of field fortifications, employed not only to an extent, but in a manner, not previously seen.

The Turkish tactics of the present war rest therefore on two, to a certain extent, new factors, and although many well-founded objections may be raised to the mode in which they were applied in detail, and many rational improvements may be proposed, yet it is impossible to wholly ignore the claims of these new factors, and their powerful influence on every rational new system of tactics.

Let us begin with the active factor of Turkish tactics. Experience has proved the falsity of all the tactical objections often raised formerly against the possibility of such a rapid fire.

The new complicated breech-loading systems have strikingly proved their serviceableness in the field even in the hands of untrained men. Magazine rifles, too, which were formerly entirely rejected as a weapon of war, have been handled without difficulty, and finally, the supply of the ammunition expended in incredible quantity, was managed on the Turkish side without any difficulty. The Turks were certainly favoured in this last particular by the circumstance that they stood almost always on the tactical defensive, but even in the few cases where the Turkish infantry carried out great offensive movements the good organization of the ammunition trains, which extended their operations up to the fire-line, were noticeable. In nearly all the

Turkish positions captured by the Russians immense stores of cartridges were found, often placed in flat boxes for convenient use between the riflemen. It was nothing unusual to find beside Turkish dead bodies in captured shelter-trenches 200-300 empty cartridge-cases : cases have been even verified where in the course of a battle single Turks have fired away up to 500 cartridges. Even in the cases where Turks advanced to attack Russian positions it has been proved that Turkish soldiers who had established themselves in front of the Russian position, have fired away then in comparatively short time 120-150 shots. The necessary corroboration of these statements is supplied by the assertion of the Russians that they captured in the course of the war in conquered positions, and in the various capitulations, in all 500,000,000 cartridges. In connection with this, it may be mentioned that the war supply of a German army corps, including the ammunition columns, consists in round numbers of 4,500,000 cartridges.

Further, the fact should not be overlooked that the distances on the ground in front of the Turkish positions were often paced and marked.

We now turn to the passive factor of the Turkish tactics—the employment of field fortifications. Here we have to deal with two things closely connected with one another, but to be considered separately—the construction of regular entrenchments and the establishing on and holding fast of ground by means of hastily made shooting-trenches.

When Turkish infantry takes up a tactical position, it tries at once to obtain cover in an extended line, using as far as possible whatever materials are to be found in the neighbourhood, and if necessary excavating a shallow shelter-trench. Where the ground permits, several infantry lines entrench themselves behind one another at short intervals on a more or less inclined slope, so as to obtain two or more tiers of fire. The Turkish infantry seems to possess great dexterity in the establishment of these shelter-trenches ; the first construction, often only a slight one, is effected with great rapidity. Technical troops are never employed on this work.

If time permits, the originally shallow trenches are deepened and the breastwork strengthened ; if the position remains occupied for several days, traverses against enfilade fire are constructed in the shelter-trenches, and by means of sloping excavations under the counterscarp cover is obtained for part of the garrison which, as long as the defenders of the shelter-trench are not actively engaged, is thus better protected from the enemy's fire.

It may be noted as a very appropriate arrangement that numerous vessels of water are placed in the shooting-trenches, and that in many cases single trenches are completely supplied with provisions, so that the defenders are not driven by hunger, and particularly by thirst, to temporarily abandon their posts. On the Russian side this occurred several times, the result being in some instances decisive tactical disadvantage, in all useless losses.

In taking up a position to be held for a considerable time, the defensive lines described above are strengthened by redoubts, placed on the highest points of the position and armed with artillery ; they serve particularly to flank the shelter trenches.

In the general disposition of a defensive line, care is generally taken, and mostly with great skill, that a forward line, if it fall into the hands of the enemy, shall afford no cover against the still occupied lines in rear.

Having thus spoken briefly in general terms of the two new factors of modern warfare, mass-fire and field entrenchments, we now turn to a short consideration of the tactical employment of the various arms.

### 3. *The Infantry.*

The Russian infantry which appears on the European theatre of war, has regiments of 3 battalions of 5 companies each ; the 5th company of each battalion bears the title of " rifle company," and is specially intended for fighting in extended order : its arms and training are, however, the same as those of the line companies. The Guard regiments have 4 battalions of 4 companies each ; a rifle battalion has 4 companies. A battalion formed up for attack, forms usually from 4 company columns, two lines, a short distance apart, the 5th (rifle) company is extended in front. A regiment formed for attack has generally 2 battalions alongside each

other, in the formation just described, the 3rd battalion as reserve in rear in battalion-mass.

As is sufficiently evident, from the descriptions of the various fights, there is no preparation or introduction of the attack by musketry fire to speak of, this introduction is generally left over to the artillery.

The attack, usually commenced at a great distance (1,000 paces or more), is generally conducted in this way. The chain of skirmishers and both the ranks formed of company columns, often also the reserve, in battalion masses, advance almost simultaneously, with small intervals, and in advancing come together, so that under the most favourable circumstances the attacking force reaches the enemy as a disorganized swarm.

If the first rush does not bring the attacking troops up to the enemy, they try to find cover and open a heavy but mostly nearly ineffective fire; tactical order is then in great measure lost, tactical leading becomes very difficult, often impossible; and, for the most part, fresh reserves must be sent forward to bring the line which has thus come to a stand into motion again.

The attacks are almost always directed frontally against the enemy's position, attempts to turn one or both flanks of the opponent are of rare occurrence.

In the defensive, the Russian infantry often proceeds too early to a counter-attack, without beforehand making full use of that rapid fire, which, if rightly employed, is so destructive at shortest ranges; the pursuit, also, of the repulsed enemy is sometimes carried out with the bayonet where firing would be much more efficacious.

The mode of fighting of the Turkish infantry on the defensive has been already referred to in the foregoing general remarks on the Turkish fire-tactics; besides, a steady holding back of, and, for the most part, a skilful employment of, the reserve, is noticeable: on the offensive, which also hurls a terrible hail of bullets before it, and is carried out by a very thick chain of skirmishers, followed closely by small bodies with closed ranks, and at greater distances by larger bodies, the evident aim is to direct the principal attack (taking advantage of the ground), on a flank of the enemy. In most cases, the advancing infantry has larger or smaller bodies of cavalry on the wings.

With respect to the above-mentioned relatively increased importance of field fortifications as compared with former times, and particularly in view of the trench work which is often executed in the course even of the fight, a point in the equipment of the infantry comes more prominently into the foreground than formerly, viz., entrenching tools.

In the combats which have been described, the deficiency of entrenching tools on the Russian side is often painfully prominent; although this disagreeable fact is partly explained by the fact that the Russian infantry soldier threw away, as a troublesome burden, the entrenching tools he carried; yet, apart from this, the equipment of the Russian Army with entrenching tools does not seem to satisfy the demands of modern warfare.

In order to secure the presence of the necessary entrenching tools at the decisive moment, three plans may be followed: (1), by the distribution of technical troops; (2), by carrying the materials on train waggons and giving them out to the troops in case of need; (3), by a permanent equipment of the infantry with entrenching tools.

In consequence, on the one hand, of the great extent to which rapid field fortification is now and will continue to be employed; on the other, of the peculiarly close connection of this trench-work with the tactical employment of infantry, the distribution of technical troops seems to be a quite inadequate means of carrying out these works. The proposal, made by a voice from the Russian Army, to equip one company of each regiment with entrenching tools, and to compensate this company for its increased load by indulgences in other respects—in other words, to attach a pioneer company to each regiment, and thus enormously to increase the technical troops—would, apart from many other disadvantages, fail to answer the desired purpose.

To carry the entrenching tools on waggons, and only to distribute them to the infantry shortly before the beginning of a fight and to take them back afterwards,



is quite impracticable; it only remains, therefore, to permanently equip infantry with such a quantity of entrenching tools as to satisfy the requirements which are now felt in the course of a battle; a sufficient reserve of tools must, of course, also be carried on waggons to fill up deficiencies and for the execution of larger works outside the actual fight. The infantry, in all purely tactical trench-work, has to keep itself, as far as possible, independent of the co-operation of technical troops; the Turkish infantry, in spite of its manifold deficiencies, has shown that this is possible.

Although voices from the Russian Army are raised against the permanent distribution of tools to the infantry, on the ground that the load is too heavy and that they would be thrown away, yet these apprehensions might be rendered groundless, by, on the one hand, a judicious construction and mode of carrying the tools, and on the other, by properly instructing the men and giving them examples of the value of the equipment.

As a matter of fact, the Russians before Plevna were deficient in entrenching tools.

The compiler, unfortunately, does not know what quantity of tools were in immediate possession of the troops; it must, however, have been excessively small.

In the beginning of September, at the commencement of the great artillery attack, when batteries had to be constructed for over 100 guns, advanced shooting trenches to be made, and cover farther in rear obtained for 6 divisions, there were given out to the troops from the field engineer park, in round numbers, about 2,000 articles of entrenching equipment, of which about 1,600 were small spades and the rest about half large spades and half picks. And this formed the greater part of the material present; for Skobelev's 3 brigades, which received none of the tools thus distributed, had hardly any.

It may be mentioned, by way of comparison, that apart from the entrenching tools with the cavalry, the artillery, and the trains, a German corps of 25 battalions has, at its immediate disposal for purposes of field fortification, about 5,000 small spades, 3,000 large spades, 1,000 picks, and 2,500 hatchets and axes. The 5,000 small spades and part of the hatchets are always carried by the infantry.

#### 4. *The Cavalry.*

Various adverse criticisms, which have been made from several quarters, and not without reason, on the unsuccessful employment of the Russian cavalry in the first period of the campaign, lay particular stress on this unsatisfactory employment of the cavalry being the more incomprehensible, that the Russian cavalry was not only comparatively strong as compared with the other arms, but also had a great numerical superiority over the weak Turkish cavalry. Both these assumptions are, however, inaccurate.

At the beginning of the war, the proportion of cavalry to infantry in the active Army was one to six, which is about the normal proportion in the German Army, and can be called certainly sufficient, but not extraordinarily large.

The reinforcements which entered the theatre of war during the course of the operations which have been treated of—10 infantry divisions, with at least 100,000 men, and the Guard cavalry and Cossacks, with at most 8,000 men—alter this proportion much to the disadvantage of the cavalry. Further, it is altogether unjust to speak of a great numerical superiority of the Russian over the Turkish cavalry. The so-called regular Turkish cavalry consisted, certainly only of 8,000 men, but 20,000 Tcherkesses formed, not only the most numerous, but decidedly the best part of the Turkish cavalry. The numerical proportion of the Russian and Turkish cavalry can, therefore, be taken generally as equal, at the commencement rather in favour of the Turks, later on rather in favour of the Russians.

With the exception of the Guards, which have a separate organization, the whole Russian cavalry of the line, together with the 20 embodied Don Cossack regiments of the first category, is, according to the latest regulations, formed permanently into 15 divisions:—14 divisions of 1 dragoon, 1 uhlán, 1 hussar, and 1 Cossack regiment, and 1 division of 4 Cossack regiments. Two Cossack regiments were not attached to divisions. The formation of larger bodies of cavalry had been refrained from in consequence of the experiences of the German Army in 1866 and 1870-71. The

divisions were intended to act independently, and were tactically formed to this end. The service of the infantry divisions was to be provided for by the regiments of the Don of the second or even of the third category (20 regiments) who were not attached to divisions.

But these principles were soon deviated from. At the beginning of hostilities the 15 cavalry divisions were assigned to the 14 Army Corps (formed each of 2 or 3 infantry divisions) and to the Grenadier Corps, so that each cavalry division became a part of the corps; and thus the independence and the power of strategically employing the cavalry divisions, which had been originally aimed at, was much interfered with.

At the beginning of hostilities the Army includes 7 cavalry divisions, attached to the same number of army corps, also a Caucasian Cossack brigade and 10 regiments of Cossacks of the Don of the second category, which latter belong to no particular division or corps, and are told off for the service of the infantry divisions.

Immediately after the crossing of the Danube, by a really wanton breaking up of the divisional formations, an entirely new large body of cavalry is formed, the advanced guard corps of General Gourko, destined for the crossing of the Balkans. This corps consists, besides the Cossack brigade of the Caucasus, of three combined brigades, the dragoon brigade, formed of the dragoon regiments of the 8th and 9th division, the so-called combined brigade containing the hussar regiment of the 9th division, and a regiment of the Don of the second category, and lastly a Don brigade consisting of two regiments of the second category.

Of the 10 regiments of the Don of the second category, which originally were without the cavalry organization and were told off to act with the infantry, 3 regiments are thus otherwise employed; there remain available for 14 infantry divisions only 7 Cossack regiments. This is evidently much too little; and in consequence a great part of the regiments belonging to cavalry divisions are taken away from the body to which they belong and attached to various infantry divisions and brigades. The cavalry divisions now soon disappear even in name, and their commanders take, according to their rank, the command of mixed bodies of troops.

In the middle of September a great cavalry corps is formed under Krylow to shut in Plevna on the west side.

The strategical task of this corps was a manifold one: it had to watch the Army of Plevna, to reconnoitre the country towards the west and south, and to meet any relieving force advancing from these directions, as far as possible from Plevna.

It is plain that in a duty of this sort, which necessitated a tolerably permanent division of the corps into several parts, its cumbrous mass-formation must have caused difficulties to the leader, even if he had been more energetic and judicious than actually was the case.

Two or three independent cavalry divisions, receiving direct from the Commander-in-Chief of the Western Army their prescribed tasks for a certain number of days, would have been, perhaps, more capable of fulfilling the end aimed at by the Commander-in-Chief.

In the idea of stopping a threatened attempt at relief from the south or west by cavalry alone there lies indisputably an over-estimation of the fighting value of cavalry alone (without infantry support); and although the retreat of Krylow before the advancing Turks, almost without striking a blow, cannot be considered as justifiable under the circumstances, yet it is hard to conceive that cavalry could eventually have succeeded in keeping an infantry corps of 10,000 men at a distance from Plevna.

From no fact and from no order can the intention be gathered of supporting Krylow's corps at the right time by infantry. The tasks, however, assigned to the German cavalry in 1870-71 never required of it to carry out a decisive combat against large masses of hostile infantry.

In connection with this, the following observation is not without foundation.

From the whole conduct of Osman Pacha at Plevna in July and August, the Russian leaders might have formed the conclusion that Osman's Army was not capable of carrying out a vigorous offensive movement, and all the Russians had to desire, therefore, was to induce the Turks by any means to leave the fortifications of Plevna and fight in the open.

Now, if in the beginning of September, the Russian Army of the West had been stationed not eastward but westward of Plevna, with two strong bridge heads on the right bank above and below Plevna somewhere about Mediwen and Rybina, and 4,000 or 5,000 cavalry been sent to watch the east side, the following state of things would have been presented.

No relieving army coming from the westward (from Widdin) or from the south (from Orchanie), and from these directions only was the advance of such an army to be expected, could unite with the Army in Plevna without having beaten the Russian Army; but the latter (leaving out of the question the strength it would have derived from proper entrenchments and from its far superior cavalry) was strong enough numerically to resist even a simultaneous attack of the relieving Army and the Army of Plevna.

If Osman, on the other hand, should try to avail himself of this disposition of the Russian Army of the West to make a sudden march eastwards and threaten the line of the Jantra, there was the highest probability that he would be overtaken by the main body of the Russian Army of the West before even reaching the Osma, and compelled to fight a battle in the open under very unfavourable circumstances.

Returning now to what actually happened before Plevna, the blockade on the west side only became effective after General Gourko took the command there, and also after very considerable masses of infantry were made available to support the cavalry.

Throwing a glance, in conclusion, on the tactical employment of the cavalry, we are struck by their excessive employment of the dismounted mode of combat. The modern *rôle* of cavalry will often bring them into situations where they must fight on foot, and for this reason they must be trained accordingly; but dismounted fighting is, and always must be, for cavalry a little-to-be-desired makeshift, opposed entirely to the nature of the arm.

It is not so with the Russian cavalry: here the dismounted combat has become a veritable mania; it is employed almost on every occasion, and without any cogent reason. The cause of this lies, without doubt, in the peace instruction of the Russian cavalry, which seems to lay exaggerated importance on the dismounted combat; for it must certainly be called exaggerated when more than once during the great manœuvres in the year 1876 whole regiments of cavalry dismounted to attack a post, and when considerable towns possessing an infantry garrison were stormed by cavalry.

The dragoons are still a good deal looked on in Russia as a body meant to fight in two ways, just as in the time of the Emperor Nicholas, who sought to realize his idea of the Centaur-like union of infantry and cavalry by the grand but unpractical creation of his dragoon corps. This creation of a dragoon corps proved itself in its first practical trial—the Eastern War—to be a complete failure, but its fundamental idea, certainly in more modest limits, is yet maintained in the Russian Army.

The dragoon regiment which belongs to every normally formed Russian cavalry division represents, in a measure, the infantry element of this division.

The dismounted combat of the Russian cavalry is an essential factor of its activity, that of the German cavalry is only a resource in case of need; the ideal Russian cavalry division is a combination of the three arms, capable of employment for any sort of fighting and endowed with great rapidity of movement; the German cavalry division is before everything cavalry only, and is expected to do its utmost as such, while, as a single arm, it must naturally give up all claim to independence in battle.

This latter arrangement conforms better than the other to the law which, in all departments of labour, is becoming more fully recognised, of the distribution of labour, and of the thereby increased capability of the whole.

To this fundamental distinction between the Russian and German cavalry, a number of peculiar occurrences in this war, of a tactical as well as strategical nature, may be attributed, which, in our opinion, are striking and in part startling.

### 5. Artillery.

The Russian field artillery is armed with breech-loading guns of two calibres; the so-called 4-pounder has a calibre of 8·7 centimetres, weight of projectile about



11 lbs., weight of barrel 614 lbs.; the limber of the 4-pounder holds 18 cartridges, and to each gun belong two ammunition waggons. The so-called 9-pounder has a calibre of 10·7 centimetres, weight of projectile 22 lbs., weight of barrel 1,250 lbs.; the limber contains 12 projectiles, and each gun has three ammunition waggons. Both Russian calibres are therefore greater than the corresponding German ones in weight of projectile as well as in weight of gun; the weight of the projectile of the 9-pounder is little inferior to that of the German 12-centimetre gun. The whole field artillery has wrought-iron carriages.

All the guns have teams of six horses; the foot artillery has batteries of eight guns, and consists half of 4-pounders and half of 9-pounders; the horse artillery has only 4-pounders, and has batteries of six guns.

To each infantry division is permanently assigned a brigade of six batteries (Nos. 1, 2, 3, 9-pounders, Nos. 4, 5, 6, 4-pounders), *i.e.*, 48 guns, or four guns to a battalion, rather more than with the normal strength of a German army corps. Two horse batteries, with twelve guns, belong to each cavalry division.

In view of the great numerical superiority of the Russian over the Turkish artillery, one would have expected that their influence would have been very perceptible in battle, and that their fire would have effectively prepared for and supported the attack of the infantry, but little of such a preparation is observable; most of the fights give the impression that the co-operation of the artillery had no influence worth mentioning on their whole progress.

The cause of this is to be looked for in two directions: 1. In the way in which they were tactically employed; 2. In the material effect they produced, which did not satisfy the claims made on them in this war.

If we cast a glance on the tactical employment of the artillery in the combats which have been described, the following points are to be marked:—

1. The batteries present are from the beginning distributed almost regularly along the line of battle; there is no holding together of a part of the artillery for combined action on a fixed point of the line of battle after the manner of our corps artillery.

2. Fire is opened at very great distances, and almost always frontally, against the enemy's position; an endeavour to enfilade this never appears; an exceptional example of this is the position taken up by the artillery on the 10th September, under instructions from Skobelev, on the east side of the Tutschenitza Gorge, for the partial enfilading of the Turkish position on the "Third Hill."

3. The Turkish artillery, always far inferior numerically to the Russian, generally gives up very soon its opposition to the Russian artillery, and retires into covered positions; and as soon as the Russian infantry advances to attack, comes into play again quite ready for fight.

4. The frontal position of the Russian artillery generally necessitates the cessation of its fire at the commencement of the infantry attack.

5. Cases in which batteries follow the infantry in their attack and try to support them in the forward positions they have taken are only exceptional; usually the artillery remains in its original positions, and during the second part of the fight quite retires into the background, while in this second period the far weaker Turkish artillery is generally very active. An energetic advance of the artillery to support the infantry attack hardly ever takes place, except under Skobelev's leadership: further examples of the sort are furnished, on the 20th July, by the battery assigned to the Kostroma regiment, and, on the 30th July, by some batteries of the Russian left wing, under Schachkowski.

The batteries, which advance with the infantry within range of the enemy's rifle fire, suffer besides such a loss in men and horses, that they become generally in a short time entirely or partially incapable of action.

Turning now to the material effect of the fire of the Russian artillery, the combats described, with the exception of Telisch, on the 28th October, afford no example of a really successful working.

The Russian artillery only finds opportunity in a few cases to fire on uncovered troops; its fire is generally directed on infantry lines behind natural cover, against shooting trenches, or against more or less regular entrenchments, and here is almost entirely without effect. In spite of a preparation of several hours by the fire of a

powerful body of artillery, the infantry attack almost always encounters an unshaken adversary.

The small effect of the Russian field artillery, in the battles of July and August, on the covered and entrenched Turkish positions, had so strongly shaken the confidence of the troops in their field artillery, that to prepare for the great attack on Plevna, in September, twenty 24-pounders were brought up from the siege park, but even these did not achieve even a tolerably satisfactory result.

The first opening of fire takes place, on an average, at 2,400 metres, at which distance the 4-pounder is considered useless, and only 9-pounders and heavy guns are employed. After approaching within 1,600 metres of the enemy's position, a few 4-pounder batteries take part in the cannonade. The result of this cannonade, carried on for several days with great energy, and to which the Turks in general only feebly reply, is almost null, if one does not count the damage to the Russian gun-carriages—a certainly very negative and questionable result.

The effect of the fire of 60 guns, directed concentrically against the redoubt of Gornja Dubnjak, on the 24th October, can hardly be considered satisfactory; one would have expected that such an overwhelming fire—60 guns to 4—would in a very short time have broken all resistance. Instead of this, the garrison of the redoubt, after enduring for several hours this apparently terrible fire, was in a condition to repulse several attempts at storming, made by superior numbers.

The capitulation of the redoubt of Telisch, on the 28th October, is the only success which can be entirely set down to the credit of the artillery.

In the supposition that, in the future, extensive field fortifications will probably play the same part as in the present Russo-Turkish War, the following demands will probably be made on the artillery:—

1. A part, and not too small a one, of the field artillery must consist of guns of considerably heavier calibre than has hitherto been assigned to field artillery, in order to sufficiently destroy the enemy's cover from long distances.

2. The light field artillery (and for this the smallest calibre hitherto employed, the 8-centimetre gun, is amply sufficient) must seek its sphere of usefulness, not in positions in the rear, but in direct co-operation with the attacking infantry. The light artillery must partly immediately accompany the attacking infantry in small fractions (even a couple of guns may, at the right spot, produce great effect), partly in larger bodies by skilful and bold manœuvring, direct a heavy fire, though it be only of short duration, on some especially important points of the enemy's position.

Acting in this way, great losses in men and horses (under some circumstances, even the loss of guns) will be unavoidable, and the responsible leader, if he will gain decisive results, must not shrink from such contingencies.

A battery which has maintained a destructive fire at a decisive point for five minutes, one minute even, and then is lost, has done more for the general good than ten batteries which, from well chosen positions in the rear, have kept up a well-aimed but, after all, a nearly ineffective fire.

### 6. *Fortifications and Field Works.*

Ardahan, Nicopolis, and Kars, fortresses equipped with a numerous artillery of heavy calibre, succumb to attack by storm; the field fortifications of Plevna, only constructed after the enemy came in sight, and partly under his fire, and for the armament of which only a comparatively small number of guns of small calibre is available, holds out for nearly five months, and is eventually only reduced by hunger. This contrast presents itself involuntarily at the head of the series of reflections which the present war calls forth on the subject of the disposition of fortresses.

Certainly, Ardahan, Nicopolis, and Kars fell so quickly, not because, but although they were real fortresses; Plevna made such a resistance, not because, but although it was only defended by field works; and, finally, these cases only prove anew the old principle, that a fortress only derives its value and importance from the troops which defend it. Nevertheless, it is not to be denied that, in the present war, field fortifications, as compared with fortresses, have played a more important part than formerly, and that this will probably also take place in future wars. In theory, fortifications and field works have the same end—to form, with the employment of

all available means, as strong a position as possible; the distinction only lies in the means available in the various cases.

The limit of these means is only fixed, in the construction of fortresses, by economical reasons, in the construction of field works by the various circumstances of the case, among which the time available plays a principal part.

Naturally, all the points of a country, which under any possible circumstances may become the foci of the war, cannot be beforehand converted into fortresses. This is impossible, not only from regard to the consideration of expense, but also for many other reasons, military and civil; only such places as have, under all circumstances, a permanent strategical value can be so treated; those permanent fortresses form only a defensive outline, and it is left to field fortifications to fill this in accordance to the requirements of the war in progress.

The great improvements in arms, as also the great increase and improvement of means of transport as compared with former times, which permit of the rapid bringing up of comparatively heavy artillery and of the extensive supply of ammunition, cause greater demands to be made than formerly for the construction of fortifications. These demands can be easily satisfied in time of peace by the construction of fortresses, with the application of all available technical appliances, if only money is obtainable; but in the construction of field fortifications, time will always, and the available labour will generally, be limited, and it has therefore to be considered what preparatory measures will serve to facilitate the rapid establishment of suitable field fortifications in a given moment.

These measures may be divided into two groups, intellectual and material.

To the first category belong the preparation in peace time of defensive schemes of all points which, in certain contingencies, may become of importance in war, and the training of the troops (not the technical arms) in the construction of large fortifications. The material measures consist of the supplying the army with a sufficient quantity of entrenching tools, and finally, of the preparation of all the timber constructions required for such works, such as blockhouses, powder magazines, gun platforms, blindages, bridges, ramps, and barracks, which should be stored in pieces in the great fortresses ready for issue.

## NOTICES OF BOOKS.

*Almanach für die k. k. Kriegs-Marine.* 1878. Edited by the Conductors of the "Mittheilungen aus dem Gebiete des See-wesens." Pola. 12mo. Size  $5\frac{1}{2}'' \times 3\frac{1}{2}''$ . Weight  $5\frac{1}{2}$  oz.

WE observe from the title page that this is the third year of publication of this useful and handy little volume. As we made its acquaintance in its previous issue, we can say that it has been greatly improved, and that the improvements have not added very much to its bulk. Now that both the Austrian and German Empires have become such important maritime powers, any publications relating to naval affairs which appear in either country are entitled to careful notice at the hands of British Officers; and the size, portability, and amount of information which this almanack contains give it a very high place amongst the many works which we owe to the pens of both German and Austrian naval Officers. A great deal of it is naturally taken up with matters chiefly concerning the Austrian Service, but still it contains a mass of facts useful and interesting to the Officers of every Navy in the world. In the first place the "get up" of the book cannot be too highly commended. It is literally a pocket-book, and can be carried in the pocket without any inconvenience.



It is printed on very thin, and at the same time excellent, paper. The type is small and also exceedingly clear; the graduation of type for headings and titles is in itself first rate. There are some fifty blank pages at the end, a pencil loop on one cover, and a small pocket on the inside of both. We recommend the type and paper to the notice of Captain Bedford should his own admirable pocket-book be reprinted. In some respects the little almanack before us resembles that useful work. Being a periodical publication, it of course deals much with passing affairs, but still there is much in it which will long continue to be of value. The first part contains several pages of rules and mathematical formulæ for navigation, nautical astronomy, gunnery, naval architecture, and marine engineering. In the second part are details of the guns in use in the different navies of the world. The third part contains lists of the fleets of all the maritime powers, with the size, armour, armament, speed, and designation of each particular ship of any importance. In the number before us this part is illustrated with plans and sections of the newer and most noteworthy vessels. There are also tables of the weights, measures, and moneys of different countries. Indeed, to the end of the third part, or about one-half of the book, it may be regarded as combining much of the information contained in Captain Bedford's "Sailor's Pocket-book," and Mr. King's "War Ships of Europe," reviewed in a previous number of the Journal. The remaining parts, IV and V, are occupied with the regulations of the Imperial Royal Navy, and complete lists of its active and retired Officers.

C. B.

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*Die Marine.* Von Kontre-Admiral BROMMY und Fregatten-Kapitän H. VON LITROW. Third edition, arranged with respect to present progress and enlarged, by Ferdinand von Kronenfels. 8vo. Vienna: Hartleben, 1878. Price 14s. 6d. Weight 3½ lbs. Size 10" × 7".

THIS is another of those books published abroad which are of such interest to naval Officers. The works of Marchal and King, both foreigners, on recent war ships, are exclusively devoted to the consideration of questions of construction and of matters connected with dockyards and machinery. The work before us, though a considerable portion of it is occupied with descriptions of the newest classes of ships of war, both armoured and unarmoured, is more extended in its scope. It attempts to present the reader, whether lay or professional, with a complete picture of the Naval Service. Appealing as it does, therefore, to a class of readers larger in number than the ranks of the Navy, either national or mercantile, could supply, it is written in a more popular and less technical style than most books of a similar character. A great deal of it is certainly quite worthy of being read merely for its own sake, and not because of any special instruction which it may be expected to convey. The first edition was published thirty years ago; and the present—the third—may be regarded as substantially a new work. There can be no doubt that the most important chapter in it, that which comprises accounts of the more noteworthy ships built within the last few years for the navies of the world, and which is equal in length to about a quarter of the whole book, is entirely new. The extensive tables at the end of foreign fleets and guns are new also and are very valuable. The first chapter is headed "The Sea," and contains a short essay upon marine physical geography. The colour, saltness, composition, gravity, and temperature of the sea are all considered in order; as well as the motion of waves, the nature of currents, tides, winds, &c. This is followed by a description of the instruments, such as the compass, log-line, chronometer, and sounding-lead, used by mariners. The second chapter gives us a short historical sketch of shipbuilding down to the introduction of steam, and explains many of the terms and processes of naval architecture. The system of construction employed in building both mercantile and foreign ships is put succinctly and clearly before the reader, who can hardly fail to derive much assistance from the really admirable illustrations with which the explanation is accompanied. The next chapter, called "The Ship's Fabric," describes in detail the several parts which make up the frame or hull of a vessel of any particular class. From this we pass to a series of chapters on the rigging and fitting out of ships, and

the systems of equipment employed for various purposes of service, and upon the organization and special duties of the different ranks of Officers and men composing the *personnel* of the Navy. After these comes the chapter which we have designated the most important in the book, viz., the one headed "The floating *matériel* of the "Fleet," which deals with the several classes of modern war ships, no matter for what country they have been constructed. The other chapters having to do with what more particularly concerns the countrymen of the authors and editors can have, naturally, but an indirect interest compared with that which this lengthened description of many of our own vessels will be found to possess for Officers of the English Navy. Not only will they here find a vast amount of information concerning ships in which, perhaps, they may have actually served; but, owing to the number of foreign vessels described, they will have ample and ready means of comparison of the one with the other. Short of an actual conflict, we know of no other way in which the relative merits of two such vessels as, say the English "Alexandra" and the Austrian "Tegetthoff," can be estimated, if it be not by a careful study of the facts concerning them, which the book we are noticing brings so conveniently together. The whole chapter is enriched by a perfect wealth of illustration which even in professional works of the kind is unusual: there is not a Navy of any importance, not a class of ship of any fighting power, which is not represented by at least one excellently drawn plan or sketch. The other departments of warlike efficiency are not neglected, and several pages are taken up with detailed descriptions of the many systems of torpedoes, which we owe to the inventive genius of such men as Lay, Whitehead, and Ericsson. The remainder of the book is occupied with notices of the work in dockyards and arsenals, and the service afloat in harbour and at sea. An interesting chapter on a naval engagement contains an account of two typical battles—Trafalgar fought in the days of sailing wooden ships, and Lissa in these modern ones of iron-clads and steam rams. The history of Tegetthoff's victory is well told, and will certainly amply repay perusal. The tables at the end are numerous and important. First we have the "Complement Lists" of ships in the German and in the Austrian Navies. We would direct the attention of English Officers to these suggestive statistics. They shew how wide is the difference between the proportion of non-combatants to combatants in our own and in foreign services. There next come tables of the dimensions, power, &c., of the Krupp, Russian, French, Woolwich, Armstrong, and Whitworth systems of ordnance. After these are tolerably complete navy lists of all nations. We have already spoken of the richness of illustration, which is a feature of the work; and we may add that twelve free-hand pictures of ships—several English amongst them—are not its least attractive feature. A valuable glossary, containing about 2,000 sea expressions, is also amongst the supplementary matter at the end, and should be of great use to students of foreign nautical terms. The merits of the work are considerable, and we doubt if anything equal to it has yet been published. C. B.

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*History of the Indian Navy (1613-1863).* By CHARLES RATHBONE LOW, Lieutenant (late) Indian Navy, F.R.G.S. Author of "The Life of F.M. Sir George Pollock, Bart., G.C.B., G.C.S.I.;" "Tales of Ocean;" "The Land of the Sun." &c. 2 vols., 8vo. London, 1877. Price 36s. Size 9" x 6". Weight 4 lb. 4 oz.

In two stout octavo volumes Lieutenant Low has attempted to relate the history of the distinguished, and now extinct, service in which he held a commission, and in which, as he tells us, "some of the best years" of his life were passed. His modest and interesting preface will be found to contain a summary of the motives by which he was impelled to undertake the work of recording the deeds of the Indian Navy, alike in war and in peace, throughout its long and honourable career of exactly two centuries and a half. He has endeavoured to erect a monument of its achievements throughout that lengthened period, similar in design to that which we owe to the patience and accuracy of the historian James, of the glories of the Royal Navy during the quarter of a century which began with the epoch of Lord Howe's victory

on the 1st of June, 1794, and ended with Lord Exmouth's attack on the city of Algiers. The result is that he has produced the most important *naval* book which has appeared in this country for many years. He seems, to some extent, to have taken James as his model; and though—as we feel sure he himself would readily admit—he has fallen far short of his distinguished predecessor in the field of naval history, yet, wielding as he does an able and practised pen, and being personally conversant with many of the details of his subject, his labours may be said to have been eminently successful. In the preparation of his work he was confronted by an extraordinary difficulty. At the present day, anyone who should undertake to narrate the story of some great department of the public service, with a career extending down to our own times, would almost certainly find that his chief embarrassment lay in the enormous wealth of materials which he would have to sift and examine before drawing upon them for his facts. If any reader at any time tried to estimate the labour of drawing an accurate picture of, say, the Royal Navy since the Battle of Navarino down to the date of the expedition to Abyssinia, and have realized the shifting condition of the Service throughout that period, he may be able to form some idea of the vast mass of documents, manuscripts, and printed matter which he would have to wade through. Yet even this would probably shrink into insignificance in comparison with the mountainous pile of evidence which the historian of the 250 years of the Indian Naval Service, corresponding with, and reporting to at least a double set of masters, local and at home, would have to weigh and summarize. This obstacle was removed from our author's path. He suffered, incredible as it may seem, from what he pungently terms "an act of Vandalism," "the destruction of the public records of the Indian Navy." Mr. Clements Markham, whom he quotes, has said in another place ("Memoir on the Indian Surveys," London, 1871, p. 5): "It has been difficult to bring together a record of the marine surveys in consequence of the destruction of documents." That he has triumphed over so unexpected and strange a difficulty is much to Lieutenant Low's credit.

It is strange that the history contained in these volumes should be so seldom thought of or so little known by the fellow-countrymen of the gallant spirits who laid the foundations, and erected the early structure of the great fabric of British power in India. More than a century before Clive's victory at Plassy the valiant seamen of the Company's vessels had been winning a name for their country and themselves by their enterprise and daring in the distant regions of the East. In 1607 a ship of the Company, the "Hector," first anchored in an Indian port, that of Surat; and the first Englishman to represent the great Association of Merchants at the Mogul's Court was the "Hector's" Captain, Hawkins. Hostile and piratical natives of these far-distant shores, as well as rival traders from other European countries, had to be withstood; and as a result of frequent contests with the former and with the Dutch and Portuguese, the Company determined to "equip their vessels for fighting as well as for trading purposes." These armed ships were the predecessors of the Indiamen, whose brilliant actions with enemies' ships continued down to a date within the present century,<sup>1</sup> and of the "Bombay Marine," or fighting force, under the immediate orders of the Government of Bombay, which eventually came to be designated the Indian Navy. It is with the story of the latter that Lieutenant Low exclusively deals.

After some brilliant conflicts, against apparently overwhelming odds, with the heavy ships of the Portuguese, the Company's Officers obtained permission to establish regular trading factories at Surat and other places. These it was necessary to protect by some organized force against all aggressors. "Hence," says our historian, "was formed the nucleus of the service that developed, first into the "Bombay Marine, and ultimately into the Indian Navy. . . . In this year, "1613, when the Indian Marine was first formed, the Company had not a single "European soldier or sepoy in their pay." The permanent establishment of the local Marine, we are told farther on (p. 24), may be dated from the year 1615. Previous

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<sup>1</sup> Mr. W. S. Lindsay, "History of Merchant Shipping," vol. ii, Appendix 11, gives a list of these actions.



to the acquisition of Bombay, in the reign of Charles II, the head-quarters of the Marine had been at Surat; and the force had been compelled to acknowledge the superiority of the Dutch in the neighbouring waters. But the splendid harbour of Bombay had not long fallen into possession of the Company when the force was transferred to it and rapidly increased in power. It soon had an opportunity of distinguishing itself against the famous Sivajee, the founder of the Mahratta power in India. The trade of the new settlement had been found to be so exposed to the depredations of the armed boats of this chieftain and of the Malabar pirates, that the local Officers applied to the Court of Directors in England for permission to construct three armed vessels to convoy the merchantmen trading to the Gulf of Persia and the Red Sea. The directors assented to this request, and appointed as their shipbuilder at Bombay Mr. Warwick Pett, a descendant of the celebrated Sir Phineas Pett, the constructor of several famous vessels of our early Navy. Mr. W. Pett was directed to proceed to Bombay and construct two ships, and thus began that course of shipbuilding, for the Royal and Indian Navies, which continued down to the middle of the present century. Lieutenant Low gives us, (vol. i, p. 298), some striking evidence of the strength and excellent construction of these Bombay-built ships, by instancing the case of the "Salsette," a frigate which was beset by ice, when, with five other ships of war and a convoy of twelve merchantmen, she was leaving the Baltic in the winter of 1808-9, and alone escaped shipwreck. The list of ships built by the eminent Parsees, Jamsetjee, Nowrojee, and Cursetjee for the Royal service (given at p. 4 of vol. ii), is, we fancy, incomplete, the name of Her Majesty's ship "Meeanee" being omitted from it. Not only did these ships excel in strength, but, we are informed (vol. ii, p. 10), that an 84-gun ship could be constructed at Bombay for 21,000*l.* less than in England.

Soon after the transfer from Surat to Bombay the service "became officially known as the Bombay Marine. An Officer was regularly appointed for the year as Admiral, and others were detailed for duty under his orders, the supply being kept up by drafts of Officers and men from the ships arriving from Europe. During all these years they had been employed in the suppression of piracy as far as their limited strength permitted, in the protection of Bombay, and also, in conjunction with the squadron stationed at Surat, in conveying the ships trading with the Persian Gulf and Red Sea, and the ports on the Malabar coast; these duties were most arduous and taxed their limited resources to the utmost, but they were fulfilled with ardour and success, and the service gained the approval and thanks of its masters. During the wars waged by this country with European Powers—the Portuguese (before their separation from Spain), the Dutch, and the French—this Marine service had often to struggle against superior maritime forces, but they bore the flag of their country not without credit, and earned the respect alike of European rivals and native enemies; indeed, as we have shown, the grants of the early privileges of the Company were mainly won by the prowess of their seamen." (Vol. i, p. 91.)

One of the most important chapters in the long history of the Company's Navy is the protracted struggle, lasting nearly half a century, with the hereditary pirate chiefs, to whom our countrymen gave the name of Angria. The power of this corsair dynasty was not finally broken until the year 1756, when a powerful fleet, under Admiral Watson, of the Royal Navy, and Commodore Sir William James, of the Bombay Marine, with several hundred troops on board—the sepoys commanded by Clive—attacked and reduced its chief stronghold. Lieutenant Low states (vol. i, p. 123) that an official uniform was first given to the service in the year 1761. If so, it must have adopted one almost at the same time as the Royal Navy, whichever of the two legends of its institution (either that of the king's admiration of the blue and white riding-habit, laced with gold, of the Duchess, whom he passed in the Park, or of Lord Anson's appearance at Court in the same colours) we think fit to give credence to. A difficulty in manning the ships seems to have been often felt, and occasionally the crews had to be "maintained at their necessary strength by drafts from the jails." This was a difficulty experienced in the kindred service at home, and one which, we are ashamed to have to say, was often solved in the same way.

Throughout its long career the Indian Navy seems to have been constantly employed on active service, against European enemies, the dreaded pirates of the Indian and Arabian coasts, and the native rulers of India over whose territories the great Company was extending its dominion. Its struggles with pirates were apparently almost incessant; and Lieutenant Low gives us an account of a remarkable manœuvre which the crews of the Company's cruisers were drilled in, with the express view of repelling piratical boarders. This was called "forming lion's mouth," and closely resembles a manœuvre, which, under a less startling name, we have often seen practised on board a ship of Her Majesty, commanded by a distinguished Officer who had seen much of the Indian vessels of war on actual service. In the second American War the Honourable Company's brig "Nautilus" maintained a gallant but unsuccessful conflict with a greatly superior American vessel, the "Peacock." The circumstances of this combat, well known to the readers of James, have been told with greater accuracy and fuller detail by Lieutenant Low, who supplies the further information that the brave man who commanded the "Nautilus," Commander Boyce, though terribly wounded, was alive and in excellent health last April. Unfortunately, since the publication of the work under review, this interesting relic of a heroic age of naval history has passed away, his death having occurred since the beginning of the present year.

The Bombay Marine took part in the first Burmese War, and a few years after that contest, "on May 1st, 1830," says Lieutenant Low (who gives a copy of the Government order (see vol. i, p. 532), though Mr. Markham, in the officially published "Memoir on Indian Surveys," p. 12, and again on p. 13, says the date was 1832), it became the Indian Navy, a designation by which it has since been always known. The Indian Navy fought in company with the ships of Her Majesty at Aden, in China, in the second Burmese War, and in the second and third China wars, when it performed always distinguished service; and its gallant deeds during the Sikh wars and in the Indian Mutiny obtained for its Officers and men much commendation at the time, commendation which, as our author shows only too clearly, was forgotten when the rewards came to be distributed. The treatment of this gallant service seems to have been, to say the least of it, ungenerous in the extreme; and amongst the benefits which a young naval Officer is sure to derive from a perusal of this valuable book, not the least will be the example therein given of the devoted resignation with which the brave men who officered the Indian Navy continued to perform their hazardous and exhausting duties, without a hope of those honorary recompenses, which is almost all a martial service can look for at the hands of its masters.

But the brilliant performances of the service in war were rivalled by the deeds of its members during peace. For so small a body it counted amongst its Officers an exceptionally large number of admirable surveyors. "The war services of the Indian Navy, as well as the beneficial and enduring results of its repression of piracy and the slave trade," says Sir R. Murchison, "are well known. These services have been varied, honourable, and useful; but in the eyes of geographers the wide-spread and lasting utility of the excellent surveys made by Officers of the Indian Navy hold an equally prominent place." Mr. Clements Markham is equally strong in his praise, and speaks ("Memoir, &c.," p. 4) of the "noble succession of surveyors," produced by the Bombay Marine. It has been the fate of this honourable service, so distinguished in every path open to naval men, to have been left long unrewarded and finally to be somewhat contemptuously abolished; and, perhaps harder still, to be confounded with those local services, such as the Bengal Marine, with which it had nothing in common but allegiance to the same masters and employment afloat. The book before us has done much to get justice done it, and we can honestly commend it to naval Officers. Unfortunately it has a serious defect: it has not got that useful appendix, an index.—C. B.

*Royal Engineers' Prize Essay, 1876.—The Attack of Fortresses in the Future.* By Captain T. Frazer, R.E. Printed for the Royal Engineer Institute, 1877. Price 4s. 9d. Weight, under 1 lb. Size, 10"  $\times$  6 $\frac{1}{4}$ "  $\times$   $\frac{3}{4}$ ". Pp. 102.

ALTHOUGH the Germans, in the war of 1870–71, besieged and took many towns, it is commonly remarked that, owing to the antiquated nature of their fortifications, and the usually feeble resistance offered by their garrisons, few data were afforded for the conduct of the actual siege of a modern fortress.

Of the preliminary operation—the investment—Paris and Metz afford examples from which military men may draw many lessons; neither are the subsequent operations against Strasburg and Belfort so wholly un instructive. For, although the great development of siege works due to the large area of modern fortresses was not called for, yet they afford good data for estimating the power of modern siege artillery, and have brought into prominent light its powerful attribute of distant breaching power.

Although principles remain the same, yet so enlarged is the sphere of siege operations since our last national experience that, were we called upon to undertake them to-morrow, we should undoubtedly have much to learn on the spot which it would be better to know beforehand, and that this fact is patent to both artillery and engineers is proved by the attention which both these arms of the service have, for the last two or three years, been giving to the subject, evidenced, as it is, by the existence of committees still at work, and by the fact that each corps has, within that period, allotted the subject for its Prize Essay.

Captain Frazer, for a second time the prize essayist of his corps, has, with the above heading as his text, produced an essay which combines the two qualities of pleasant reading and valuable reference.

Of a necessity he draws his deductions from the Franco-German war, and enters, at more or less length, into the rather numerous technical details which are called for by the conditional sub-heads of the essay.

Into all these it is not our intention to follow him, noticing only those which are of general, and we may perhaps add, of national interest.

After briefly touching upon the various processes to which a hostile fortress may be subjected, viz., blockade, assault, masking, and bombardment, we reach the most interesting pages of the essay in those which treat of investment as preliminary to regular approach.

There is perhaps no problem which requires more systematic skill than the complete investment of one force by another. To non-military minds it is a continual puzzle, why a force should ever allow itself to be invested, and once invested, why it should not be able, by sheer weight, to break through its enemies' extended lines, wherever and whenever it pleases.

In the first place, an unbeaten and active force or garrison can rarely be invested without a great preponderance of numbers on the investing side, such as the Russians have been forced to bring to bear on Plevna. A beaten army, on the contrary, demoralised and unfit for exertion for some few days after its defeat, will awaken to find itself engirdled with entrenchments, the construction of which it should at all hazards have disputed, and this possibly by a force little, if at all, exceeding its own strength. Such was the French case at Metz.

Again, the investment of many fortresses is simplified by the very means from which they derive their strength, such, for example, as inundations, which, though forbidding attack, demand but slight investment.

The great size of modern fortresses, and the large area commanded by their artillery, has of necessity increased the length of investment lines, and this, at first sight, would appear to be a distinct gain for the defence; but, as is well pointed out in the essay, it is not a wholly unmixed blessing, and, like all the results of modern science in warfare, acts and reacts impartially on both attack and defence. For, while greater extension of investment lines must mean a less depth of troops to defend them, it also implies a greater distance for the besieged to pass over before delivering his attack, which is thus shorn of the very elements most necessary to its success, viz., secrecy and suddenness, while, on the investing side, the breech-loader gives power of retention until the telegraph has summoned reserves.



Again, turning movements are of necessity denied to the besieged, whose attack must be frontal, with an ever-increasing exposure of his flanks.

But perhaps what most militates against the success of ordinary sorties is, as Captain Frazer puts it, "the cheerless task of coming out to go back again." It is no wonder if even the best troops show an occasional tendency to anticipate the hour of their recall.

Hard work indeed will fall to the lot of the engineers in these early days of a siege. They will have on their hands many technical duties in connection with the actual lines of investment, the repairs and maintenance and construction of new and existing lines of communication by road, river, railway, and telegraph, added to the collection and parking of the great bulk of stores required for the further prosecution of the siege.

We have no battalions of pioneers, and our weak force of engineer companies will have to draw largely on the intelligent co-operation of their brethren of the infantry to accomplish work which modern warfare does not admit of being left undone.

Passing from the investment period to that of the regular siege, the points which naturally call for the closest attention are the modifications necessitated by modern artillery.

A comparison of our proposed siege train with those of Russia, Prussia, Austria, and Italy, shows our weight of metal to be above the average, accompanied by a greater variety of ammunition, both perhaps questionable advantages where ease of transport and simplicity of stores are desirable.

Our siege train is, even as regards the guns, in a somewhat tentative stage, still more so as regards the carriages and their accessories, which, perhaps even more than the guns themselves, are affected by modern progress.

Popular interest in England, readily awakened in all that pertains to our field and turret guns, is somewhat torpid as regards the intermediate order of siege artillery, a fact due possibly to our insular position and the absence of such incentives as are offered by the border fortresses of continental nations.

We have during the last twenty years constructed fortresses, both at home and abroad, perhaps unsurpassed by those of any other nation, but still fortresses and all to do with them command little national sympathy; they are rather regarded with a jealous eye, as involving unremunerative expenditure and wounding national vanity by hinting at the possible vulnerability of our naval line of defence.

It is scarcely strange, then, that while any supposed defect in our field or naval guns deeply stirs the national mind, our siege and garrison artillery is slowly working its way to perfection unnoticed and uncared for.

Again, in these days of manœuvres the arm of the service which can derive least professional benefit as a whole is probably the engineers, whose destructive and constructive tendencies are of a necessity almost wholly quiescent, or forced for umpire purposes into ludicrous imitations of reality, little instructive to the army at large, and somewhat wounding to the self-respect of those who have year after year to carry them out. Moreover, siege and garrison artillery as such have never as yet taken any part in our annual manœuvres.

A maritime Plevna on Dartmoor or elsewhere, with a month's investment and siege, would not only be a taste of such work for the army at large, but would probably do more to supply artillerymen and engineers with the necessary data to meet each other's requirements than many a ream of official foolscap.

It is on these two arms of the service that the brunt of technical siege work naturally falls, and when called for it is work that must be done both well and quickly under almost certain difficulty.

Such a case naturally calls for experience as its most important element of success. Duet singers may, it is true, practice apart, but a joint rehearsal is apt to improve the concert.

And that some such rehearsing is necessary will readily be gathered by any reader of that part of Captain Frazer's essay which treats of siege batteries and their accessories. Nearly thirty pages are devoted to this subject alone, and are full of statistics and suggestions for meeting difficulties both present and prospective.

Again, as we near the fortress and the engineers' especial arts of sapping and mining are brought into play, the ever-recurring suggestions in the essay bring the

same idea to mind, that more extended practice than that offered by pure instruction in the oft-tortured fields of Chatham would, by combining the presence of a large number of Officers with the advantage always accruing from change of scene, go far to solve outstanding questions, and perhaps lead to the detection of errors where none are supposed to exist.

In Captain Frazer's summing up of the necessary conditions for success in siege operations technical knowledge holds a place, and rightly so, but a siege-trench is no place for the theorist, and the technical knowledge must be of that reliable type into which early training does not always blossom unless matured by practice.

S. W.

*Des Marches et des Combats.* Par le Général Berthaut. Première Partie. Marche en Avant, Combat Offensive. Second Edition. 1 vol. Paris: Librairie Militaire de J. Dumaine, Rue et Passage Dauphine, 30. 1877. Price about 2s. 6d. Size  $7\frac{1}{2}'' \times 4\frac{3}{4}'' \times \frac{3}{4}''$ . Pp. 224. Weight under 10 oz.

The first edition of this work was published anonymously in 1875. This edition bears its author's name. It is an excellent little treatise, and deals concisely both with principles and details.

*The War Correspondence of the "Daily News," 1877-78.* Continued from the fall of Kars to the signature of the Preliminaries of Peace. 1 vol. London: Macmillan and Co., 1878. Price 10s. 6d. Size  $7\frac{3}{4}'' \times 5\frac{3}{4}'' \times 1\frac{1}{2}''$ . Pp. 599. Weight just over  $1\frac{1}{4}$  lbs.

The second of the two volumes of this work.

*The Officer's Memorandum Book for Peace and War.* Compiled by Lieutenant-Colonel R. Harrison. Second Edition. Revised and corrected. London: C. Kegan Paul and Co. London, 1878. Price 3s. 6d. Size  $4\frac{3}{4}'' \times 3\frac{1}{2}'' \times \frac{1}{2}''$ . Pp. 124. Weight under 4 oz.

This book is as it were a skeleton of notes put together by Colonel Harrison, to be further enlarged and added to by any one who may use it. It does not profess to be exhaustive.

# The Journal

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Friday, June 21st, 1878.

THE RIGHT HON. LORD HAMPTON, G.C.B., &c., &c., &c., in  
the Chair.

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DISCUSSION ON THE PRIZE AND OTHER NAVAL ESSAYS OF 1878.

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### HEADS OF SUBJECTS TREATED, DRAWN UP IN ORDER TO FACILITATE DISCUSSION.

THE Essays are four in number, viz. :—The Prize Essay, by Captain P. H. Colomb, R.N. ; that by Commander Noel ; that by Lieutenant James B. Hays : and that by Lieutenant Sydney M. Eardley-Wilmot.

#### *The Prize Essay,*

after an introductory survey of the British Naval Empire, its strength and weakness, passes to the geographical distribution of British ports of supply, and rests the propulsive powers of the necessary war ships upon these geographical facts.

Our naval policy, the Essay observes, should rest upon—

- (1) The geographical position of our Naval Empire ;
- (2) Our actual peace Navy ;
- (3) The geographical condition of a possible naval combination against us, and the nature and distribution of neighbouring naval forces.

Passing to the ship-construction necessary to satisfy these conditions, the Essay asks for moderate speed, twin screws, coal capacity to steam 4,000 miles at five knots, and an auxiliary sail power.

Every other quality must give way to the provision of the coal supply named.

The Essay lays great stress on the establishment of a definite classification of ships, and recommends four classes, viz. :—

- (1.) The fleet-ship of 6,000 to 8,000 tons.
- (2.) The frigate of 4,000 tons.
- (3.) The corvette of 2,000 tons.
- (4.) The sloop of 600 to 1,000 tons.
- (5.) Gunboats, torpedo vessels, despatch vessels, &c.

One great principle of "duality" should pervade all war ships. Each should be able in all cases to stand one blow, or one accident, without being totally disabled. Everything, in fact, should be double ; two engines, two sets of boilers, two bottoms and sides, compartments so multiplied that no two when filled would disable the ship, two sets of pumps and fire-engines, two sets of steering gear, double armament, and where possible two separate batteries.

Coming to the construction of each class, and taking first the "fleet-ship," the turret ship is abandoned and the broadside upheld.



The "Inflexible" type is condemned as being too costly a structure for the carriage of only four guns, however great the individual power of each may be.

By new arrangement of armour and armament in a ship called the "Outrageous," the essay seeks to show how for a 6,000-ton ship, 10-inch armour may be substituted for 6 and 8-inch; and how twelve 18-ton guns on the broadside may take the place of ten 12-ton guns. How also a second armament of light guns on an upper deck may resist the attack of gunboats, torpedo vessels, and unarmoured ships carrying armour-piercing guns.

In all constructions the point insisted on is that the standard or measure of power must be COST. It is argued that if a ship is *twice* as strong as another, but costs *three times* as much, she should be looked on as the weaker of the two when considered as an item of naval policy.

The "frigate" should be a smaller "fleet-ship," with armour in like proportion.

The "corvette" would not greatly differ from the present type, except as to twin screws and reduced sail power.

The sloop would not greatly differ from the "Frolic" and "Kestrel" class.

Gunboats, &c., would differ from all previous classes, inasmuch as they would be designed for special service in special localities, whereas every ship in the four classes would be for "general service."

Respecting the two great questions of "End-on *versus* Broadside Fire?" and of "Few heavy, or many light, guns for the unarmoured ship?" the essay gives up "end-on fire" as immaterial; and supports "many light guns" against "few heavy ones" as a general principle. But all fleet-ships and frigates should have a double armament of heavy guns to fight their fellows, and of light guns to meet the attack of numerous small craft.

The sloop, as a ship for inshore duties, requires one or more heavy guns for operating against batteries and ships seeking the security of shoal water, but requires a numerous light armament to sustain her against a ship of her class so armed.

Passing to the present peace establishment of our Navy, the Essay finds that on January 1st, 1877, we had on duty in various parts of the world 13 fleet-ships, 12 frigates, 18 corvettes, 38 sloops, 46 gunboats, and 60 despatch vessels.

The Essay holds that the chief use of the fleet-ship in war would be to blockade military ports, and to act in concert against escaped squadrons of the enemy.

The frigate would have like duties, but would also guard threatened lines of communication.

The corvette and the sloop would operate directly as commerce protectors, keeping open the sea routes and guarding coaling stations from isolated attacks.

The sloops would operate inshore, and would supplement the duties of the corvette.

On a survey of our position with a very large European coalition against us, the essay does not see much difficulty in meeting it, so long as a definite naval policy, on the grounds sketched out, is maintained.

On the question of harbour defence the essay condemns the "harbour defence ships," but commends torpedo vessels and coast volunteer forces.

On the general question of "weapons," the Prize Essay recommends the ram for all classes of ships, abandons the Harvey torpedo as practically useless, and considers the Whitehead torpedo as yet untried. It considers that armour plating is yet more in its infancy than gunpowder, and thinks the gun is nearer its limit of penetration than armour of its resistance. The spar torpedo is probably the most effective weapon for harbour defence, provided it be in the hands of daring men.

#### *Commander Noel's Essay.*

Commander Noel, after a discussion on naval policy and administration, which was thought by the referees to be beyond the scope of the inquiry, passes at once to a description of the fighting ships proper to be employed.

He divides the Navy into four classes of ships:—

- (1.) The ironclad proper.
- (2.) The ocean cruiser, perhaps partly armoured.
- (3.) The smaller sea-going cruiser.
- (4.) The coast defence ironclads, the gunboats and torpedo vessels.

Taking the ironclad first, he considers she must be prepared to fight a naval duel; to take part in the line of battle; to oppose successfully a squadron of gunboats; to engage forts; and, lastly, to fight two or more unarmoured vessels.

In view of these contingencies she must be a ram; must carry a fair number of guns from 12 to 20 tons weight, the guns to have 90° training; and torpedoedoes to a safe extent.

His type becomes a broadside ship, with an armour belt at the water line, and carried up to the lower port-sills, and with transverse armour bulkheads to protect from raking fire.

The weights are thus distributed:—Taking the total weight as 1, then '225 goes to armour, '1 to armament, and '125 to coal. A ship of 8,000 tons would thus have 1,800 tons of armour, 800 tons of armament, and 1,000 tons of coal. The ship is to be fully rigged.

The second series of ships should consist of corvettes and frigates of 2,000 to 5,000 tons. They are to be rams, with '06 of armour to protect vital parts; the armament to be '08, and coal '16 of the displacement. The armament of the frigate would be 6½-ton guns, and of the corvette twenty 64-pounders. The ships should be fully rigged.

"Special cruisers" without armour and of great speed should form part of the "ocean cruisers" series. A 2,000-ton ship of this class would carry 60 tons of armament and 400 tons of coal.

The third series of ships consists of sloops and gunboats, should vary in size and description, according to the service for which they are designed; to be fully rigged, to "economise fuel and afford instruction in seamanship, as well as to have the "power of moving from port to port."

In the fourth series of ships Commander Noel includes the "ironclad, or first class" of vessel for coast defence at home and abroad, should as nearly as possible represent "a floating fort, her steaming power and seaworthiness being sufficient to ensure her safety if caught in a gale on the coast she has to defend. Sail power is unnecessary, as also great speed under steam, but her principal object will be to carry a "powerful armament and heavy armour."

Such a coast vessel would be of 10,000 tons displacement, carrying twelve 38-ton guns in single turrets, or on the Moncrieff system, *en barbette*.

Coast defence would be completed by gunboats carrying one heavy gun each, and supported by small swift torpedo vessels.

Fast merchant steamers lightly armed are approved of as useful adjuncts, as advocated by Mr. Brassey and the late Mr. W. S. Lindsay.

Commander Noel next passes to the question of "Organization," and takes up the entry and education and training of Officers and men.

Cadets should be entered between the ages of fourteen and fifteen, and selected by means of test examinations. Then to have six months' training on shore or in a harbour ship, and nine months' in a sea-going training ship of 1,800 tons. Then, to be appointed midshipman in a man-of-war, and at the age of nineteen to pass the final examination as at present.

Commander Noel thinks that the days of Gunnery Lieutenants are numbered, as every Lieutenant should be competent to fulfil those duties. He commends the abolition of a separate class of navigating Officers, and thinks that navigating Commanders might be employed on the Admiral's staff.

Respecting the engineer Officers, Commander Noel applauds the French system, and thinks that if the Admiralty manufactured their own engines, a more perfect training for engineer Officers might be had.

Speaking of the seamen, Commander Noel says their entry and training is more satisfactory now than it has ever been before. We have enough seamen for our present requirements, but it would be better to have 20,000, seamen proper, and to enter 3,500 boys yearly with that view.

Naval barracks in our principal dockyards would facilitate training. There parade drills should be given up and the men taught to be riflemen, ship artillerymen, swordsmen, but above all they must be seamen.

Speaking of the marine forces, Commander Noel does not think their presence on board ships of war is necessary for the purposes of discipline, but purely military

duties and those of domestics are exactly suited to marines on board ship. All attempts to turn the seaman into a soldier Commander Noel trusts will fail.

It is impossible that the Royal Marine Artillery should exist on its present footing much longer, and it is suggested that they might become a corps of torpedo men, or "Royal Marine Engineers."

Of the reserve men, Commander Noel asks for 20,000 of the first class reserve, and to abolish the second class when these are secured. The present system of training answers admirably, and if England were really in danger, a large number of men who had served in the Navy would be found ready to serve again.

*Lieutenant James B. Haye*

proposes to arrange the ships in classes.

- (1.) Experimental ships of all natures.
- (2.) Ironclads of light draught.
- (3.) Ironclads (without masts).
- (4.) Ironclads (rigged).
- (5.) Cruizers.
- (6.) Other vessels.

The first series would include "Inflexibles," "rams" pure and simple, "torpedo-boats," and "circular ships."

The second series includes the "Cyclops" and "Glatton" classes.

The third series is represented by the "Devastation" and "Thunderer." The third series is represented by Captain Scott's "Victory."

The fourth series embraces ships such as the "Northampton," "Inconstant," "Flamingo," and "Lily."

The fifth series would include the "Mallard," "Spey," "Snake," Chinese "Gamma," and "Salamis" classes.

As to the modes of propulsion, Lieutenant Haye appears to object to the twin screw for all classes, on account of their liability to foul. Sail power, abandoned altogether in the second and third series, should be dispensed with as far as possible in the fifth series, the "cruizers," and apparently chiefly confined to the fourth series, the second class ironclads. The turbine is recommended, if it is necessary to rely on sail power.

The essayist next offers observations on the interior arrangements of the fighting ships: conning towers, steering gear, voice tubes, signals, &c., &c.

Of the Harvey torpedo he says, "It is doubtful if this torpedo will ever play a prominent part in future naval warfare." He places value on the spar torpedo, but much more on the Whitehead.

Speaking generally of sail power, the essayist says that, as long as we hold our coal depôts, sail power may be dispensed with to a very great extent, but "other nations could not so well dispense with sail power."

Coming to armament, Lieutenant Haye, while admitting that heavier guns must be carried in special ships to compete with foreign Powers, says that the 38-ton gun may be taken as most suitable for the heavy ironclads, the lighter ironclads of the fourth series carrying the 18-ton gun. These ships should have also a light armament of 12 or 20-pounders for use against torpedo vessels, enemy's open ports, &c.

Respecting bow and stern fire, the essayist holds that the latter at least must be retained as a defence against rams.

The protection of our commerce must rest upon the security of a sufficient number of outlying depôts. These should have despatch, look-out, gun, and torpedo vessels, permanently attached to them, and, in some cases, even mastless ironclads.

Merchant steamers must be lightly armed, fitted for using Harvey's torpedoes, strengthened at the bow for ramming, and divided into several watertight compartments. Fast ocean steamers must depend principally on their speed. The system of convoys must be revised for the slower steamers.

The naval volunteer or supplemental force embraces all our reserves. We cannot expect a large reserve of men who have served in the Navy. The Coast Guard is commended. In war time there would be such a demand for Royal Naval Reserve men for merchant ships that few would be available for the fleet. Gunboats should be attached to each district to train reserve men in firing at sea.



The reserves should be divided into two classes, the reserve for general service, and the Coast Defence Corps for local service. The present Royal Naval Reserve should form the Reserve proper, and the Coast Guard and Royal Naval Artillery Volunteers the Coast Defence Corps. All reserves should be under the command of an Admiral with a proper staff. The coast to be divided into districts and divisions as at present, each under the command of proper Officers.

As to colonial and home defence "our best defence is to take the initiative," by blockading the coast of a possible invader, and by continued naval and military expeditions to attack or threaten the enemy wherever he may be vulnerable.

The essay closes with remarks on the entry and training of Officers and seamen.

*Lieutenant Eardley-Wilmot.*

Lieutenant Wilmot begins his Essay by an introduction asserting that naval power is weakened when the fighting ships of one Power greatly preponderate; when the neutral flag covers enemies' goods; when privateering is abolished; and when from colonies the right to equip supplemental forces is taken.

The Navy cannot be considered solely defensive as it covers attacks.

Crippling commercial intercourse is one of the chief aims of a Navy. "Fighting ships" must be compromises. They must have speed; handiness; heavy armament; armour for guns and vital parts: stowage for fuel; must offer a small mark; must have numerous compartments; and the cost must be small.

Fourteen knots should be the lowest speed. Sacrifices must be made to get turning power.

Broadside fire is important.

Few heavy guns are preferable to many light guns.

The gunners must be protected even if the ships be made more vulnerable.

Masts should be abolished in ironclads.

There should be coal stowage enough to enable them to steam from England to Malta at 10 knots.

There should be two sets of engines and boilers at least.

Doors in watertight compartments should be above water.

The "Inflexible" type is too costly for a single ship.

The ship for service in the Channel and Mediterranean should be a mastless turret ship, of 250 feet in length and 100 feet beam, with a speed of 14 knots, and the turrets placed abreast of each other, so as to give a perfect bow and stern fire.

For distant service, the "Hercules" and "Triumph" represent the type of ship preferred.

Coming to the protection of our commerce, the Essay observes that our supplies at home could never be stopped while we have an adequate force to keep the command of the sea. We have nothing to fear from making everything which may assist a nation contraband of war, because we possess such a reserve of power and vitality in a maritime aspect, that only an impossible combination could stop our vessels from carrying our trade to all parts of the world.

In considering vessels of war for protecting our commerce, there has been a tendency to imagine a vessel can combine every attribute, and disappointment has resulted.

For an ordinary cruiser we require:—speed; moderate size; coal-carrying capacity; moderate cost; ability to carry one or two heavy guns. They should be about 200 feet long, 35 feet beam, 1,800 tons, and 3,000 horse-power. They should have a mixed armament of heavy and light guns. Spars should be light, and spread of canvas in proportion. They should have the Whitehead torpedo. 15 knots' speed should be realized, and no sacrifice of steam power should be made to give sailing power.

The "belted cruiser" is not approved.

Armed merchant steamers would be useful, but it would be short-sighted policy to depend entirely on them.

As to the Naval Volunteers, or supplemental force, the Essay declares that the question of an adequate reserve of seamen is not yet answered. There would be a

want of experienced seamen, which would be felt at the beginning of a war, because our supply of men is kept up by the entry of boys, and because a large portion leave the Navy after serving ten years as men. The rate of pay should be further increased, to induce the good men to serve a second ten years.

The Royal Naval Reserve is too costly, and could not be relied on, except for home defence, and the real reserve must be an overflow from the Navy.

The Naval Artillery Volunteers are well adapted to form a torpedo defence corps.

A point which deserves to be remarked is the number of men on board an English man-of-war who cannot be utilized in the event of casualties at the guns. We are inundated with cooks, stewards, and servants, who are only available as carriers, and that under a rigid surveillance.

We should have a first and second reserve, the first to consist of the Coast Guard, and men who have served ten years in the Navy. The second reserve to consist of the Royal Naval Reserve and Royal Naval Artillery Volunteers. The former reserve to man ships, and the latter to be employed in coast defence.

As to colonial and home defence, the Essay claims that each colony having self-government should provide some measure of self-protection.

We should defend a limited number of well-defined points, rather than attempt an all-round defence. Earthworks should form part of the system of defence, to be supplemented by vessels and torpedoes. The vessels should be floating fortresses, and gunboats carrying one heavy gun.

But with a Navy powerful enough to blockade an enemy's ports, so as to prevent him issuing forth to make a descent on your coasts, you have already an almost perfect defence.

Submarine defence is a necessity for our harbours and the mouths of rivers.

#### *Summary.*

The great questions raised for discussion by these Essays appear to be the following:—

- (1.) The amount of reliance which may be safely placed on steam propulsion, and on depôts for the supply of coal.
- (2.) The best means of protecting these depôts.
- (3.) The dangers to which our Naval Empire is exposed: invasion, blockade, isolated attacks on home and colonial sea-ports, the ravages of "Alabamas," the cutting of our lines of communication, the dangers to our carrying trade involved in the temptations offered by the Declaration of Paris.
- (4.) The old question of turret and broadside.
- (5.) The newer question of the relative value of beam and end-on fire.
- (6.) The question whether many light guns or few heavy guns should form the armament.
- (7.) Whether ships should be armed to fight their own or other classes.
- (8.) Whether is the gun or the armour nearer its final limit of strength for a given weight and space.
- (9.) The relative value of the ram.
- (10.) The relative values of the spar, the Harvey, and the Whitehead torpedo.
- (11.) The entry and training of Officers and men.
- (12.) The provision and duties of reserves.
- (13.) The employment of Naval Volunteer Corps.
- (14.) Canvas or steam.
- (15.) The classification of our men-of-war.

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THE CHAIRMAN: Gentlemen, I believe it is usual for the Chairman on these occasions to open the proceedings by a few remarks upon the subject to which we are about to give our attention; following that custom, I beg to say I feel great pleasure in acceding to the request which I had the honour of receiving, that I would preside at this discussion, and, Gentlemen, I do not believe that you could

have selected any Chairman who would enter into our proceedings to-day with a more sincere interest than I do. The subject of the Essay has at this moment unusual claims upon our attention. I find it thus described: "Great Britain's "Maritime Power; how best developed as regards Fighting Ships; Protection "of Commerce; Naval, Volunteer or Supplemental Force; Colonial and Home "Defence." I think every one here will agree with me that in a national point of view, it would be very difficult to select any subject of greater national importance than this. For these reasons I highly appreciate the valuable system of this Institution of granting a gold medal every year for essays on subjects which are germane to our military and naval position. It is a very admirable custom, and likely to produce very good effects. I think it is impossible that the medal could have been awarded to any subject of greater interest than that which I have just described. And I must congratulate this Institution on the able papers<sup>1</sup> which have been written, and I must specially be allowed to congratulate Captain Colomb, who is the successful candidate. As far as I have been able to study the four Essays which are now before us, they are such as to do great credit to the Officers who wrote them;<sup>2</sup> and I think we cannot fail to take notice of the fact that the second in order, so far as they are before me—and I think I shall not be unfair if I say the second in merit—is written by Commander Noel, who was the successful candidate upon the last occasion of the naval prize two years ago. I must not detain you by longer preliminary remarks. I hold in my hand a *précis* (as it appears to me, extremely well done) of each of the four Essays, and at the end there is a summary of the various points raised in them. It states, "The great questions "raised for discussion by these Essays appear to be the following," and then follow thirteen heads. But I hope I shall not be considered guilty of presumption if I venture, on looking over these thirteen heads of the summary, to add two more; the first is the great question of "canvas or steam," to what extent our men-of-war are to be propelled either wholly by one or wholly by the other, or in what proportion are both to be resorted to. This subject is touched of course very naturally in the body of these Essays, and therefore, I think it ought to be mentioned in the summary. The other question is, I think, scarcely less important, "The question of the classification of our men-of-war." I see that in the body of these Essays this is a subject very naturally discussed, and with this remarkable result, that I observe no two of the writers of these Essays quite agree with each other. It is very important we should understand what is to be the classification of our men-of-war hereafter, and therefore, I hope I have not been at all presumptuous in adding those two questions as subjects for debate. With these few remarks I will at once invite the expression of opinion upon the papers before us. I may perhaps remind you of the rule which limits speakers on these occasions to ten minutes.

Captain W. DAWSON, R.N.: My Lord, I do not feel myself capable of discussing four Essays and fifteen subjects in ten minutes, and I must appeal to the meeting as I proceed, whether it may not be found proper to alter the rule, as has been done at preceding discussions of an important nature like this. I join heartily with Lord Hampton in congratulating the Institution on having brought into public existence four very valuable Essays; but, limited as we are to time for discussing them, I shall confine my remarks chiefly to the Prize Essay. We have laid before us in that talented composition, on broad comprehensive lines, a most statesmanlike view of the maritime policy which should guide us in defending our empire of the seas. That empire is not merely the British Islands, not merely the Colonies connected with the British Islands, but it is the ocean highways, and that great and growing commerce which proceeds from one to the other, without which this little island would soon sink into insignificance. When we once grasp that great imperial principle, we then have brought before us most convincingly and clearly in this invaluable Essay, what are the main points to be defended in order to protect that empire of the seas which has come down to us from our immediate forefathers.

<sup>1</sup> The essay by Commander Collingwood Selby, though not recommended for publication, was honourably mentioned by the referees.—Ed.

<sup>2</sup> Eleven essays were sent in in competition for the gold medal.—Ed.



Captain Colomb has placed these points before us very clearly and exhaustively. I am prepared to accept these broad imperial principles of maritime policy on the whole, but exception may be taken to details; and I should like to ask for further information on some minor points. One of the questions which I would ask for the sake of information is as to the basis on which the proposed coal-carrying power of the ships is to be based. It is stated to be that of the ship steaming a certain number of knots for 2,000 or 3,000 miles, and then steaming at the same rate back again. I suppose the object of a ship going that distance to a point midway between two depôts is not merely that she should steam back again, but that she should do something in the interval between her arriving at and leaving the mid-ocean point; in other words, that she should perform a six or a twelve months' cruise. I want to know what is to be her motor power in that interval of six or twelve months between her arrival and departure from the mid-ocean point. I have no doubt that there is some simple answer to this question, but I have not been able myself to master it. Then the question is naturally brought before us in connection with this imperial policy as to the substitution of steam only for auxiliary sails. It is impossible for anyone who looks forward impartially to the future, to the prospects of a great maritime war, not to see that the abolition of masts and sails, at least in our larger and in our smaller vessels, is inevitable. The whole tendency since the introduction of steam, has been towards its substitution for sail power. It is merely a question of time and of circumstances. Those young Officers I see around me, who are looking forward to a professional future which is denied to me, are, no doubt, looking forward to seasons of national struggles for existence in which actions must be fought with "foemen worthy of our steel," and they wish to hasten the time when they shall have the most effective weapons of offence. Naturally, however, we older Officers, who will not share in the coming struggles at sea, do not like to have the reminiscences of our past taken away. I think we cannot, however, but see that when the time of active service against an equal foe comes, men-of-wars' men will be only too thankful to get rid of every rope and mast which is likely to foul their screws.

There is one point in Captain Colomb's invaluable Essay in which I think he has fallen into an inaccuracy. Those who have had the privilege of being taught by Captain Colomb, in this Institute, from time to time, must have remarked how extremely accurate he is in all his statements. I am therefore all the more surprised to find a statement with which I cannot agree as a true rendering of contemporary history. As I understand Captain Colomb's paper, he says, in effect, that at some recent period, the naval authorities took it into their heads to adopt a line of policy for the protection of our empire of the seas by the defence of the coasts of these islands, which Captain Colomb justly deems short-sighted, and, that in consequence of having adopted that short-sighted policy, they intentionally built, at an expense of several millions of money, a certain class of ships (unseaworthy) for the defence of our stormy coasts; whereas, such ships are the least capable of performing coast defence duties in stormy seas of any ships in the British Navy. Those ships were subsequently labelled "Coast Defence Ships." Now my memory of the circumstances is quite different. My authority on the subject is not only the statements in the public newspapers, before these ships were built; but also a paper read by the present Director of Naval Construction, before the "Glatton" touched water. My remembrance of those rather unprophectic utterances is, that the "Glatton" was intended to be built to fulfil exactly the maritime policy which Captain Colomb indicates, namely, to steam into the middle of the Atlantic, at a certain speed, carrying adequate coals, and to there fight an action, and then steam straight back again; but when the "Glatton" was launched, she and her consorts were found to be unseaworthy, and incapable of keeping the seas, except in calm weather; and because it was not looked upon as a proper and respectable thing to put them in the Navy List as "ships that won't swim," they invented a new name for unseaworthiness, namely, "Coast Defence Ships." I would ask any sane man if there is any sane seaman, who would knowingly construct ships that are unseaworthy, in order to defend the stormy coasts of Great Britain.

Then again, I may be told, that these ships are not coast defence ships, but that they were intentionally built, in order that they might be more efficient

as "harbour defence ships." Is there any seaman who would think of specially selecting for the defence of the entrance to the Thames or the Mersey, the Tyne or the Humber, vessels that draw twenty feet of water? I appeal to my friend, Commander Noel, who proposed a 10,000-ton coast defence ship, if he was placed in a position of command, for the purpose of defending the flats at the entrance of the Thames, against a hostile fleet, which would he prefer, a 10,000-ton ship, drawing 26 feet of water, which could not move from her anchorage, except at high water, and then, with half-a-dozen pilots and tug-vessels looking out upon her bows and stern and on all sides? Or whether he would not prefer to have fifty 200-ton flat-bottomed gunboats, which would pass over any of the flats, in any direction, at high water, trusting to their obscurity and to the shoals, for safety from large ships.

If a dozen of such little vessels did come to grief, Commander Noel would only lose a fourth of his armament. It is a matter of common sense, that ships that won't swim in all weathers, are not specially good for coast defence, and that ships drawing twenty feet of water are not essentially the best for the defence of our small and shallow harbours. I may be told that these vessels are not unseaworthy, because, in the month of June, they are sent a few miles outside deep-water harbours, with a squadron of "nurses," provided with boats to pick up their crews, and under one of the most careful Admirals of the Fleet, who would take care that if the barometer falls, they should be sent away from the coast they are to defend, into one of the ports near at hand. I would remind the meeting that one of these "coast defence ships" was, on one occasion, sent from Plymouth to Cork; the Admiral being an old-fashioned Officer, who thought ships were built to swim, looked very carefully at the barometer, and sent the coast defence ship out of port, but without a "nurse." Now, when the Americans sent the original "monitor" from port to port, they sent a "nurse" with her, and when an ordinary breeze sprang up off Cape Hatteras, the "nurse" sent her open boats, and withdrew the crew, who were, of course, quite safe in open boats, and let the monitor go to the bottom.

The bottom of the sea seems the natural destination of all ironclads, when they touch anything harder than water; but for the vessels we are now discussing, the ordinary waves of the sea suffice to send them to the bottom.

The English Admiral did not send a "nurse" to take care of the English crew of the English coast defence ship, when she ventured from Plymouth to Cork, and the result was, that when a breeze sprang up on the English coast, its gallant defenders very nearly went to the bottom. Instead of continuing the passage to Cork, the coast defence ship put back into port, and the Captain reported, that it was only by a merciful interposition of Providence that he and his crew were not at the bottom of the sea. Whatever else these ships are, they have no special fitness for the defence of stormy coasts, or of shallow harbours. I don't think, therefore, they could have been designed for such purposes.

Turning from this question of imperial policy, to the question of ships, I find that Captain Colomb has given us a rough sketch of an ironclad vessel, which he calls the "Outrageous." Now, at the outset, I venture to say that Captain Colomb does not put himself forward as a naval architect. He simply puts before us a rough sketch of a possible ship, illustrating general principles.

Those who examine that rough sketch carefully, will find a combination of most valuable suggestions, which ought not to be passed lightly over, but should receive very careful consideration. There are, however, some details suggested in that sketch of an ironclad ship, which are open to debate, and there is one especially, which, perhaps, some present may look upon as outrageous, in more senses than one. I allude to the unarmoured belt. Passing over that debatable point, there are several most valuable suggestions. One of those excellent recommendations, is that in which armour is sacrificed in order to get increased armament. In the day of battle, one hundred tons additional ordnance will be of far more value than one hundred tons of additional armour. I am thankful to see, that not only Captain Colomb, but the other essayists have all laid great stress on increasing the offensive powers of existing ships. What, I would venture to ask this assembly, is it that makes the lion the king of the forest? Is it the thickness of his hide? or is it not

the power of his teeth, and the force of his claws? what is it that made the "Amethyst" the useless ship she was for three hours in the presence of a Peruvian vessel? Was it the thinness of her sides? why her sides were thick enough to resist the concussions of the air, which was all they had to endure. What made her so helpless was, that she had no offensive weapons by which she could do injury to such a foe. She had neither ram, nor torpedo, nor a gun worth anything in such a contest; consequently, this defender of British interests in the Pacific was quite helpless. The foundation of this error is simply a matter of false policy. A notion is prevalent, that ships of a given class are only to fight with vessels of the same class; and are not to take advantage of the points in which small vessels are superior to large ones. That is an utter absurdity. What is the use of building a ship like the "Inflexible" if she is only to fight a vessel of her own class? Why she would be the most useless ship in the Navy, if she was incapable of fighting vessels of other classes, because it is most unlikely that she will ever exchange shots with a vessel of her own special class. A British ship, sent out to the ends of the earth, to protect British interests, must be prepared to do injury in some way to whatever vessel she is unable to run away from. If she has swift legs, she can run away. But if she has not got swift legs (and British ships in former days as compared with foreigners, had very bad legs, and could not always run away), then she must either strike or fight. The only time Lord Nelson tried to run away he found great difficulty, because his ship could not run fast enough, and he only escaped by getting behind some friendly rocks.

Should a superior squadron of smaller British vessels meet a single ship of a heavier class of some other nation, ought they not to be able to leave their mark on the larger vessel?

If a single British ship meets a hostile squadron, or a superior single ship, and cannot run away, what is she to do? If she has not got legs to run away, she must either strike her flag, or if she has weapons capable of inflicting injury, she must fight; and she must not, in such a case, ask any questions as to the thickness of the sides of the enemy.

Where there is no alternative but to fight or strike, I hope the British Navy will not forget Sir Richard Grenville's single ship fighting 50 sail of Spain, and that it is not come to the disgraceful pitch, that there is any Officer that, if provided with a beak, a torpedo, or an armour-piercing gun, would strike his flag when opposed by a vessel heavier than his own, without trying the chances of war in an endeavour to run his beak under her armour, to aim a torpedo at her bottom, or to plant a few shots below the water line at the ends. In any fight that takes place between a short gunboat provided with a beak, and a long ironclad, let it be known to all young Officers who have command of such small vessels, that they have a very fair chance for life in such an unequal contest. In the case of ramming, the smaller and quicker vessel will have more chance of hitting with her beak than the longer vessel.

Though I do say that the British flag is equivalent to several inches of armour, I do not mean to say that the smaller vessel is to seek a combat; but if the combat is forced upon her, the British vessel should have the means given her to speak loudly and forcibly, in the name of Great Britain, with all the ram, torpedo, and gun-power suitable to her tonnage. The great mistake in the armament of our ships is not only that the weight of ordnance carried is too small in proportion to tonnage, but that the individual guns are not sufficiently varied to enable them to fight vessels of dissimilar classes.

I have always advocated mixed armaments. Each ship of war, should not only carry a few large guns, which will penetrate the thicker-sided vessels; but also a number of smaller, and it may be, less protected guns, for the purpose of penetrating the thinner-sided vessels. If the "Inflexible" be attacked by a number of thin-sided vessels carrying heavy ordnance, she ought to be able to defend herself against those vessels which actually exist and might readily be multiplied, quite as much as against another "Inflexible," of which very few exist, or can be quickly produced.

But the "Inflexible" is rendered incapable of adding smaller and partially protected guns, of say 12 tons weight to her offensive power, by the adoption of turrets which limit the offensive force to four guns, the value of which depends upon four pairs of eyes. If she was a broadside vessel, she would not only be able to carry these



four 80-ton guns on each side, but by throwing off 200 tons of armour, she might also carry a very large number of smaller ordnance outside her armoured part. These guns would make her additionally powerful in resisting any combined attack made upon her by a squadron of smaller vessels, or when taking part in a bombardment.

There is another point, in the "Outrageous," which ought not to be overlooked, and that is the principle of duality, a principle of very vital importance, upon which I need not further dilate, but will simply call attention to its great value. I regret to observe that the essayists condemn entirely the Harvey towing torpedo. I always hoped that the Harvey towing torpedo might be found a very useful weapon for defensive purposes, to defend an ironclad under weigh against an attack by a ram. If there have been any experimental practice in seagoing squadrons, or any further experience in towing torpedoes at sea in recent years, which disproves my anticipations of its value as a defensive weapon, I can quite understand the essayist coming to conclusions adverse to its use; but I have no recent experimental knowledge or experience on the matter; and in former years I spoke mere opinions formed on slender experiments made in the early period of the Harvey experience.

Commander CURTIS: I think both Captain Colomb and Lieutenant Hays propose to do away with sail power. Captain Colomb admits a small portion of canvas, about half what we have at present. I think we are all agreed that in such seas as the Baltic and the Mediterranean, ironclads of the first class should do away with canvas altogether, and any action they might fight may be fought by lowering their torpedo boats (which in future will fight in conjunction with the ironclad ships), and they will have their orders to torpedo when opportunity occurs. I think the large ships will have quite enough to do with looking after and ramming one another while the torpedo boats will take all favourable opportunities to make their own particular attack. Lieutenant Wilmot says his ship the "Zealous" covered 30,000 miles with 1,600 tons of coal. I think myself the efficiency of the ship depends very much upon the ability she will contain within herself with regard to power of locomotion. In event of coal or machinery failing, she can fall back upon her sail-power. I think our Navy should have recruited from the Mercantile Marine, bargemen and those who get their living on the water, on our coasts, &c. I see one of the questions for discussion is how best to preserve the pre-eminence of naval power by recruiting, and what force we should recruit from. I may say that from my experience of ten or twelve years as a First Lieutenant, of the lads we get from reformatories, they do not turn out all that we could desire, and we must look for our valuable recruits to the seafaring population. With regard to the rig of our ships, I think they should be square rigged forward, and square main topsail, &c., similar to despatch boat "Vigilant," rigged in 1855, or gunboat. The spars should be duplicates of one another, so that the ship would not require so many spars; and as actions would be fought under steam, I do not see the necessity of having double stays and double ropes. I hope Captain Colomb will modify his idea as to the stability of ships, *steadiness of platform*, I should prefer to call it, because I only know two things or nautical terms, that is "stiffness," and "crankness." The difficulties of the Cleopatra Needle ship arose I think from having the centre of gravity and the meta-centre together as nearly as possible. I spoke to Mr. Matthews, the second in command of that vessel; he said "she was very steady; we thought we were never coming up again, inasmuch as she had not reserve power or very little within herself to right herself." If you bring the meta-centre and the centre of gravity close together, the ship loses her stiffness and you get a greater lever and shorten the fulcrum, and the pressure of canvas has greater power to capsize the ship. The "Stability of Platform Theory," is fallacious altogether; the ship will not right herself so quickly: the ship may appear steady, but if you unnerve the seamen and Officers of the ship, you lose half the battle; they do not put confidence in a certain class of ships. A sphere, cask, or flat raft are the steadiest forms for flotation, without rolling motion: "*but*," they have no stiffness to speak of as such.

I recollect the case of the "Hecate" coming from Alexandria to Malta with the Indian mails on board in about 1844; she was becalmed, she burnt her coals out and they had to burn the midshipmen's chests, spare spars, and everything on board of her. I do think there is a time coming when our nation will make use of improve-

ments. I must say if in an open fire I burn a hundredweight of coal with only 14lbs. of residue, that when they will combine more oxygen with the carburetted hydrogen gas of the coal, that is to say with the down-draft (and this is to be done I am certain), they will burn not only the coal but the smoke and they will not be seen by the enemy, and the ships will be able to carry enough coal, as it will be all consumed, except that which is not combustible.

"I think Lieutenant Wilmot has hit upon the right class of vessel, though he has rather shortened her too much. I say a vessel should not be more than four and a half times the length of her beam, and she should be a semi-spheroid to water line. If I want to embrace an oblong rectangular, a semi-spheroid will give the least resistance in the water. I went a little while ago to look at the "Monarch," and I must say as a piece of naval architecture I could not understand it, because three-fourths of the ship was mere friction. Three-fourths of her sides were perfect walls. If any midshipman was going to tow a spar he would tow it big-end forwards and not the tapered end forwards, so that I think our present ships are not what should be desired. I think also all our ships should be double enders, if they do not have dual ships, and I believe the time is coming when we shall have dual ships. However, with the single ships I should recommend bean-cod bows or ends, and that the ram should be an independent adjunct to the ship, with a spring piston head or compound spring and hydraulic ram to strike 1,000 tons blow. The ship proper should have an up-and-down stem, and stern with ram affixed, bean-cod ends, four screws and rudders and two circular turrets, and if you place two circular turrets within a fort at either end you will get an all-round fire with the exception of 42 degrees. I do hope that Captain Colomb will see his way not to persevere with his demand for this steadiness or stability of platform, as it is termed.<sup>1</sup>

Admiral HAMILTON, C.B. : In the first place, my Lord, I should wish very much to second the compliments and congratulations with which you commenced your speech, to the Council of this Institution for the great success that has attended the

<sup>1</sup> Marines work well at Ascension, why not garrison our coal depôts with the corps ? In 1854 we could not get seamen for the "Royal Albert" fitting out, and Marines and Marine Artillerymen fitted all the gun gear. A large body of Coast Guardsmen were drafted on board previous to going to the Crimea, excepting the long-shore old men, and Civil Service men ; they were all that could be desired, enduring heavy and steady work—no bad language ; they set an example to the younger men, which benefited them during the rest of the commission ; a more united set of Officers and men never existed—comfort with efficiency—I have never seen her like since.

I never see any comparison in the House of Commons, touching the relative expenditure in guarding our commerce and our Colonies. The increased cost of our Army and Navy, I venture to say, has not increased in the same relative proportion to colonial and floating wealth to guard.

Our experience of vessels ramming as at present constructed is—"Vanguard" and "Iron Duke," the German ironclads, "Grosser Kurfürst," and "Konig "Wilhelm," and some time ago a gunboat in the Channel : all the rammers were more or less damaged, proving that the present construction is faulty ; they should be able to give a blow sufficient to stave the ribs of an enemy without turning their ram athwart ships, or splitting it up.

The ram of the "Konig Wilhelm" has certainly proved most effectually destructive, but, at the same time, it has demonstrated the weakness of its own construction. Viewed from the bottom of the dock, the ram and portion of the stem itself are seen to be twisted over to the port side at an angle of 45 deg., and the bottom plating and the armour above gapes wide open from within a few feet of the keel to the upper-deck, all the rivets (tapped rivets) which secured them to the stem being, in shipbuilding parlance, sheared—that is, the heads drawn through the holes or broken off short. The armour-plating terminating at the armour-shelf has left the stem by shearing off the rivets, and the stem itself is broken short off at the armour-shelf, and also at its scarf, some six feet below the ram.—JAMES D. CURTIS, Commander, R.N.

granting a medal for the Prize Essay. The Prize Essay is a most valuable Essay, and I have no hesitation in saying we may all gain some practical information from it and the three other essays. I do not agree with the writer on several points, and, as you have pointed out, the writers differ materially among themselves; but in addition to these we are given to understand that seven other Officers sent in essays, and everyone who has ever written a paper or an essay knows very well that, allowing that they succeed in imparting no information to those who read them, one thing is certain, that no one writes papers who does not himself gain a considerable amount of information from so doing. I therefore say every one of those Officers who have written those essays are more valuable Officers and better public servants after having written them, than they would have been if they had not done so. To those who have been unsuccessful I would only say, "try again." These papers are very widely read through the Journal of the Institution, and they will diffuse information throughout the whole of the Services. I may say that the newest idea I have gained is from that very valuable portion of Captain Colomb's essay, in which he deals with the protection of our commerce, which is much more easily protected than I had previously been aware of. That the referees have made a wise selection in bestowing the prize upon Captain Colomb, I think all will agree. Of course Captain Colomb has one advantage over his competitors; he is older, he has had the advantage of having held responsible commands, therefore he has more experience. He has served on several Admiralty Committees; therefore he has had a certain amount of knowledge of the civil administration of the Admiralty which the others did not possess. And owing to this he has recognised two facts which they do not recognise. The first is the existence of that very obnoxious individual the Chancellor of the Exchequer! Now I have no doubt our noble Chairman will confirm me when I say, by the tight grip he has on the national purse-strings he shuts up a good many beneficent plans and ideas of the Secretary of State for War and of the First Lords of the Admiralty with regard to the Services they represent. The next point he recognised is, that owing to our peculiar system of government, our changes of administration are very great and rapid and no one man is long enough in power to impress his character on the Service. Those two important facts are very much to be considered—his is a practical essay, whereas in many respects the others are theoretical. In my opinion both Captain Colomb and Captain Noel give a great deal too much time and attention to the details of ship building, and far beyond the province of naval Officers, and encroaching on that of the naval architect. I remember at one of the dockyards I was connected with, the Chief Constructor had an idea that the authorities were going to call on him for a plan of an ironclad. In conjunction with his chief draughtsman he got out what appeared an excellent idea. When, however, he went thoroughly into the question of weights he reduced one thing and then another, until he came to the conclusion that the Chief Constructor of a dockyard did not possess sufficient data to design that complicated structure, an ironclad. That is the only part of his essay in which, I think, Captain Colomb has not taken a practical view. We have had a very able summary placed before us, pointing out the questions for discussion, and the first question is "The amount of reliance which may be safely placed upon steam propulsion and on depôts for the supply of coal?" I am one of those who say that we cannot do without sail at present, whatever the future may bring forth. Engines will fail, boilers will fail, and in the commencement of a war, coal depôts will fail; therefore we should not place too much reliance on steam power alone, but sail power should be the auxiliary. The next question is "The best means of protecting these depôts?" That, in my opinion, is best done by keeping up our naval supremacy, which will prevent any Power concentrating a large force and taking them: at the same time they must be slightly garrisoned in order to keep off the attack of privateers or of solitary cruisers. Then as to the third question—the dangers to which our naval empire is exposed—I think Captain Colomb has answered that very conclusively in the part of his essay which dwells upon the protection of our commercial routes, that there is no occasion to say anything more. Next comes the "old question of turret and broadside," and in this there is great difference of opinion. My idea is, with Admiral Porter, that you must have your broadside ships for rapidity of fire to keep down that of the enemy, and at the same time you require heavy monitor and turret ships, where



men can fire perfectly under shelter, to implant the heavy blow. Therefore I go in for mixed armaments. The next question is whether ships should be armed to fight their own or other classes. I certainly think that vessels should fight with their own class, but at the same time if a vessel falls in with a ship of another class she must fight her. In the old days the classes were kept pretty distinct, but still we sometimes find that frigates fought line-of-battle ships; and there is the case of Lord Cochrane in the little "Speedy" brig and the Spanish frigate he captured; but these were exceptions to the rule. Whether the gun or the armour is nearer its final limit of strength, is a question for civil engineers. Then comes the question as to the age of the entry and the training of Officers and men. And on that point I think Captain Noel's paper is very good indeed. I have had opportunities of comparing boys from the training ships at Portland, Plymouth, and Falmouth, entered at the early age, with boys entered in the coast guard ship between 16½ or 18 years of age, under precisely the same system as the younger boys in training ships. On one occasion going on board I saw some boys on the gangway who drilled so admirably that I asked the Officer which of the training ships they came from (we then had boys from "Boscawen," "Implacable," "Impregnable," and "Ganges," on board besides the older boys): he said (to my surprise), "They are our own first-class boys" that we have raised, they have been about three months in the ship." Those boys were 1½ to 2 years older than the boys coming from the training ships. The captains of the sea-going ships, to whom these boys were sent, were ordered to report upon them, and the report was that these older boys, although they had not been brought up in the training ships, were superior to the younger boys. Their instructor from the training ships also considered them more attentive and zealous. This I think will raise the question whether it will not be better to enter naval cadets at 15 rather than at 13. The old naval coast volunteers were supposed to be fishermen, boatmen, and men of that sort who would protect the coast. Unfortunately that part of the service got most frightfully abused. I remember in the "Achilles" having 60 of these men upon the quarter-deck and asking them where they came from, and I found that the majority were farm labourers, and out of these 60 men there were not four that knew starboard from port, and yet these men were naval volunteers. The result was, these men instead of being drilled at the guns were employed to do all the dirty work of the ship. Under a proper system, that is a corps which might be productive of the greatest advantage, for you might get thousands of men round our coasts to join it, who would be a great source of strength to us. There are one or two points of detail that I should like to mention. Lieutenant Hays talks very much about the danger of the screw being fouled. Theoretically there is no doubt that it is so. However, in the American civil war, Admiral Farragut went up the rivers repeatedly and attacked forts; he always had topsail, jib, spanker, and fore-sail bent. Therefore I need not say he had a considerable amount of top hamper, but no single instance occurred that I know of where an American ship was disabled in action by her screw being fouled. On one occasion a ram was sent down to attack eight wooden gunboats, and two of those gunboats were specially told off to put nets round her stern and foul her screw, but they did not succeed. Therefore, judging from past experience, I think fouling a screw in action will not occur very often. Lieutenant Hays recommended the Turbine. No doubt the turbine is theoretically the best motive power for a man-of-war—practically speaking it is not a success at present. There is one remark in Commander Noel's essay against which I particularly wish to enter my strong protest, and that is where he says Officers of the present day are not the seamen they were. It is 20 years ago since our noble Chairman gave me my first command, and during that time I have had under my orders a good many lieutenants, and I can only say the lieutenants of the present day are quite equal to those who were with me 20 years ago. Captain Colomb was with me a short time ago in the "Achilles" in 1873. Admiral Randolph had his flag on board, and on leaving, Admiral Randolph complimented the lieutenants on the efficient manner in which they performed their duty. The lieutenants of the present day are in my opinion quite equal to the old ones. Another idea to which I dissent is the abolition of gunnery lieutenants and that every navigating lieutenant ought to be a gunnery lieutenant and *vice versa*, but I think we should have one man for navigation and another man for gunnery, according to the natural

turn of mind. Each man has his own particular talent, and he should do that particular work, and we should not put the round peg in the square hole.

Captain LONG, R.N. : I should like to make one or two remarks, from the fact that naval Officers who have served on foreign stations ought, I think, to speak their minds on these occasions. I recognise to the full the great value of Captain Colomb's essay, and only want to say a word on one or two points. The first point is that the great difference between naval supremacy abroad at the present day and formerly is the existence of telegraphic communication. That has been brought home to me in a very marked way on many occasions, and it is more valuable to have a powerful vessel that can go rapidly from your telegraphic centre, performing the service you require, and come back rapidly, ready to perform another service, than to have a number of small vessels that go blundering about and are never heard of for months. We have heard a great deal of "bases," and of course everybody recognises the necessity of them. There are, however, one or two cases where our bases are store ships, and there I think they should be sea-going store ships. With regard to the western trade routes, the construction of a canal through the Isthmus of Panama, which I have no doubt will be done before very long, will materially modify those western routes. I do not propose to make any remarks about anything with regard to which, I feel satisfied, the authorities who have the governing of our naval affairs are fully alive, therefore, that will cause me to leave out a very large proportion of subjects which I otherwise should have remarked upon, because our naval authorities are very successful in those things ; but with regard to the ideal war ship I would remark first as to her mobility, in which I include "manœuvring power" as well as "speed." I think that is by far the most important quality in any ship. With regard to compound engines, that appears to be a point open to question. I am happy to say we have now got vertical cylinders, which are much superior to horizontal ones ; the trial of the "Nelson" and "Northampton" will throw light on this subject. With respect to the engines I have observed with very great regret that Mr. Loftus Perkins's system is not to be tested. In Mr. King's book he tells us, page 116, that it was to be tested, but it appears no notice is taken of it in the estimates. It seems to me to be a very valuable system. And even though its success be doubtful, it should be tested, for it promises to reduce the consumption of coal by one-half, and that is a matter of vital importance. With regard to Captain Colomb's opinions about reducing sail power, I entirely agree with him in principle, with this slight modification, that I should retain at least two yards on the foremast, those I should stow in crutches on deck when not required aloft. The next point about the ideal war ship appears to be her offensive powers. On that point I really do not feel that I can speak with any authority whatever, but I should be inclined to add submarine tubes for the discharge of Whiteheads, which are known to be very formidable weapons. And I think submarine tubes are more valuable than above-water tubes. Of course if you see the Whitehead when it is fired, that gives you a better chance, but if you do not see it when it is fired, you cannot find out that it has been fired from two to five seconds out of the 30 seconds which would be allowed you to avoid it. A single-screw ship would not have a chance to avoid it at a distance of 300 yards, but a double-screw ship might avoid it. I am glad to see Captain Colomb advocates rams for all vessels. With regard to the guns, I would only wish to endorse what Captain Dawson said about the most powerful and hardest hitting guns being put on our ships. I should be very sorry to be in any ship that had not as many guns as she could carry with which I could hurt any adversary. Then I come to the defensive power. Now Captain Dawson very justly remarked it is not the thickness of her armour that makes her powerful ; at the same time, unless you have a well defended ship, you will find her offensive power of very little use. With regard to the dual principle and watertight compartments, I think they are very valuable ; but are these precautions sufficient against Whiteheads ? I do not think they are, without external protection. I believe the general opinion abroad is that external protection would be useful in rivers and inland seas, but that it cannot be made use of in the open ocean with the ship going at high speed. If that is the case, I think your fleet would be very easily destroyed by a much smaller one, but I do not see why it should be the case. I cannot help thinking our architects are competent to give us some system of submarine outriggers to enable you to carry your nets in action, so as to avoid the attacks of the smaller vessels,

which appears to be the only point in which the large ship is not superior to every other sort of ship. The Whitehead torpedo of course can be launched from a vessel of small size and much less costly than an ironclad which it is attacking, and to whose artillery the Whitehead vessel may be made invulnerable, and although we are told two blows would not sink a vessel, yet at the same time two blows might render her unmanageable. Then if nets outside the ship are required, the most important thing would be the protection of her screw. I happened on one occasion to be on a ship; we were steaming with one engine and her screw was fouled by an inch-and-a-half rope attached to the end of a towing hawser. We could not start the screw without having headway on, and so we were towed out of the anchorage and started the screw. Unfortunately the small rope that was left at the end of the hawser had got round the bases of the screw and stopped it by wedging it. It was rather curious to think that an inch-and-a-half rope should stop the screw of a ship like that. I have lately been engaged in Rochester creek, and I can call to mind four different occasions on which the steam launches have been rendered useless, owing to the fouling of their screws by ropes. I therefore think the protection of a screw is a matter of great importance. Lastly, with regard to submarine projectiles we must remember they are in their infancy.<sup>1</sup>

Admiral HAMILTON: I am well aware how the screw is fouled. An inch-and-a-half rope did the same for me in a paddle steamer. I was only saying how rare it is in actual warfare. In the whole annals of American history there was not a single case of a vessel being stopped from fighting by her screw being fouled.

Commander CUSTANCE: I wish to offer a few remarks upon two subjects: one of armament and the other of training of men. I am encouraged to do this by some remarks of Captain Colomb, R.N. I have not had the opportunity of reading Commander Noel's Essay, but I gather that in his opinion the present system of training men is good. It will be remembered by those who have read Captain Colomb's Essay that he compares the "Inflexible" with the "Gamma;" his conclusion I quite agree with, but I think his argument might be improved upon. He considers the "Inflexible" as one ship, and I think there he is a little wrong, because she is a "fleet" ship and ought to be considered as one of a fleet. We must therefore consider this: take some given sum of money, say 3,000,000*l.*, what is the best squadron we can make for three millions of money? It is not too much, because the Italians are investing 2,500,000*l.* on four ships. What is the best squadron for 3,000,000*l.*? It will produce 6 "Inflexibles," or it will produce 120 "Gammas." Now which is most powerful? I will not answer this directly but will say that there are two distinct ways in which a squadron may be given superiority; it may have superiority of numbers or of individual excellence; it cannot have both. The same sum of money utilized by the same brain cannot give superiority of numbers and superiority of individual excellence.<sup>2</sup> The "Inflexible" represents individual superiority, the "Gamma" represents the superiority due to numbers. This question has been answered by the Admiralty; they have had to consider whether they would build 6 "Inflexibles" or a larger number of slightly smaller ships. Instead of going to

<sup>1</sup> With regard to Lieutenant Haye's remarks about clearing, lifting and non-lifting screws, I wish to point out that on the occasion I referred to, the screw could not be lifted, as the frame was wedged tight in the well.—L. LONG.

<sup>2</sup> Whichever superiority be given, whether it be that due to numbers or to individual excellence, the object is the same, viz., to enable the maximum to be concentrated on the decisive points. Bearing in mind that the object is to concentrate power, are there no disadvantages in *large* numbers or in *great* individual excellence? The objection to a large number of ships is that they are difficult to handle, that is to say, it is not easy to concentrate power. A smaller number of ships of greater individual superiority would have the advantage. On the other hand, a small number of ships of great individual excellence cannot be manœuvred with any more facility than a slightly larger number of individually weaker ships, and would be at a disadvantage in point of numbers. In the case of large numbers, individual superiority is of more importance than numbers; but in the case of great individual excellence, numbers are likely to beat individual superiority.



11,000 tons they have taken a displacement of 8,500 tons in the "Ajax," costing 350,000*l.*, which will give them for 3,000,000*l.* 9 ships. We therefore have 9 "Ajaxes" against 5 "Inflexibles," 9 rams, and 18 pairs of 38-ton guns against 6 rams and 12 pairs of 80-ton guns. The decision as to which is the best of these squadrons must be left to Officers who have commanded fleets. The Admiralty, who have greater experience than anybody else in the country, have decided that the 9 rams and 18 pairs of 38-ton guns are superior to the 6 rams and the 12 pairs of 80-ton guns. A French constructor, Monsieur Dislère, also places 8,000 tons as the maximum displacement to which it is likely we shall return.

I should now wish to pass to the armament of individual ships. Captain Colomb has proposed 12 25-ton guns for his first-class ship. In this question of armament, I think the difficulty of handling a considerable number of guns must be taken into account. There is a limit to the number which can be handled effectively. It is a question which should be decided by experiment, whether 12 guns, 6 a side, is not more than you can get the maximum number of hits out of. I should like to suggest that the trial might be, say whether the five 9-inch guns of the "Bellerophon" will not give as many hits as the eight 9-inch guns of the "Minotaur." I think the smoke and the difficulty of passing the orders along a long deck is very considerable. To give an example of the evil effects of smoke: some 15 years ago, I was in an action in a frigate, one of the few actions that have been fought by ships. She was a 35-ton gun frigate, 18 guns on the side. We were engaged and the captains of the after guns very rarely saw the batteries we were firing at, the smoke was so thick. They fired a round every three or four minutes perhaps. That was a case in my own experience. Of course 18 guns are many more than we have now to deal with, but still it shows that there is some cause for inquiry. I am also led to believe experiments have been carried out in the Italian fleet, which have shown that a ship carrying five guns a side only fired two guns out of the five. I have not all the conditions of what they were firing at, but this is another point to show that there is something in this. I do not think people have sufficiently realized what it is to engage at 10 or 12 knots.<sup>1</sup> I think the Officers of the "Shah" can tell you something about that. Passing now to electric firing, upon which so much money has been spent and which everybody talked so much about, the "Shah" fired an electric broadside at 300 yards at the "Huascar," but she never hit her, the broadside went 20 yards astern. The whole thing is so complicated, it is very questionable whether it will be of any use. All the practice which takes place is not to be relied upon. The broadside is laid for a particular distance and the ships always pass the target at that particular distance in practice. Now in action you cannot pass at your own particular distance, because there are two people who have to decide. You may have your broadside laid for 500 yards, and the other man for 200, and you cannot both pass at your proper distance, and if you do not pass at the distance for which you are laid the errors are very large. I should like to see this question settled by experiment; it never has been yet, as far as I am aware of. This view is also taken by several Officers with whom I have come in contact.

I should now wish to pass to the training question, which I gather from the *précis*, Commander Noel thinks very perfect. The *émeutes* we have had on one or two of the ships that have gone to sea lately, I think have shown that all is not quite right in the training establishment. The boys' training is all very well, but certainly not that of the men.<sup>2</sup> The great evil of it all is the gunnery ships; they appear to me to do an immense amount of damage, because they take nine-tenths of the best men away to one establishment, and leave all the troublesome ones in another. The young hands have nobody to look after them. It is an evil recognised by I may say countless Officers who have had to do with the training of the men in the home ports, and till you do away with these gunnery ships, you never can have the great body of the service properly trained and disciplined.

Captain VERNEY: My Lord, there are 13 headings, I see, to be discussed, and I

<sup>1</sup> When engaging at these high speeds, the dangerous interval is so short that even a short smoke interval may greatly interfere with hitting.

<sup>2</sup> *Vide* Papers read at the Institution by Captain J. C. Wilson, R.N., and the discussions thereon.—R. N. C.

have a good deal to say upon all of them ; I will, however, only now say a word upon the last two, viz., upon the question of the Reserves and Volunteers. I happened to have had lately a coastguard appointment, and I ought to know a little about the Reserves, for it fell to my duty to have to inspect the Royal Naval Reserve men. If this country should unhappily be involved in war, we are quite sure to call upon these men, and I am very glad to bear my testimony to this, that they will be found to be a first-rate body of men. I have had to inspect them frequently and sometimes under circumstances of some little aggravation to themselves, and I have had to inspect them when they have been under the drill of no very good tempered officers, and when I have known that there have been many things to make their drill a little uncomfortable to themselves, and I have the greatest admiration for their patience, their perseverance, the great trouble with which they have mastered their drill, coming from merchant ships with very little discipline, and during the month they have been under training they have come out remarkably well, and I am quite sure if we place our dependence upon them in the time of need we shall not be disappointed. I have also had something to do with seeing the Naval Volunteer Corps, particularly the one at Liverpool. They went to sea for 48 hours in the guard ship. At the same time some of the coast guard were embarked, so I got hold of one or two of the coast guard and asked them how these Royal Naval Volunteers behaved at sea. Now who are these men ? Why, many of them are clerks in offices : many of them come under the heading of what people popularly call "gentlemen," whatever that means, and many are people with soft hands and accustomed to wear kid gloves. The coast guard men told me that these men fell into their work like old blue-jackets, they flinched from nothing. They kept their messes in good order ; they were up in the morning. I heard that after their tea at five o'clock, one of them wanted to know when they were going to have dinner, and was a little astonished to hear they had had their dinner at 12. As to discipline they came well to the front and did their duty like men. I am sure this Institution is glad to hear the opinion of one Officer, whatever others may think. That is my experience of these two bodies of men. If the time of need suddenly arrives, we shall not be disappointed in these Naval Reserve men, and we shall have within call these large bodies of Naval Volunteers at the sea ports, and at some preconcerted signals I am sure we should get a fine body of fellows willing to undergo some description of hardship if they were suddenly embarked for a few days for any special service.

Admiral HAMILTON : I am glad to confirm what Captain Verney has said on that point. I have had the same experience he has had.

Captain SCOTT, R.N : Although the noble Chairman pointed out some differences in the opinions of the essayists, there is a general concurrence amongst them as to the armament of ships, and they are, I think, pretty nearly agreed that the power of our ships wants further development, especially as regards the guns. With reference to this point, I will take the "Inflexible," a type of war ship with which the essayists appear *not* to be too well satisfied. She is of very large tonnage with four enormous guns, but with no reserve of heavy ordnance ; and is therefore wanting in that quality of principle for which Captain Colomb has so ably contended as essential in an ironclad's fitments. The "Inflexible" is likewise deficient in light guns, and is therefore inefficient as a cruiser. I think an ironclad that wants another vessel, or several small craft to protect her, cannot be considered an efficient war ship, and this brings me to another point, which Captain Colomb as well as others of the essayists have so ably brought out, which is, that all our vessels should be well adapted for foreign service or for service at a distance from our shores. Before putting before you the ground upon which I think you will agree that this is correct, I should like to point out that there is an error underlying the whole principle of our naval armaments, viz., that of increasing the defence at the expense of the power of attack. I believe in all our ironclads, from the "Inflexible" downwards, the due proportion of the power of attack is now being sacrificed to the defence, but the whole naval policy of our country has heretofore been and must continue to be one of "attack." Our power mainly consists in offensive warfare and *not* in remaining on the defensive. I therefore wish to point out, that all our turret vessels share equally with the "Inflexible" in deficiency of offensive power. They all have very few guns, and these are in many cases dependent upon machinery, which is

exceedingly difficult to keep in working order, which requires an engineer to manipulate, and which may break down at a critical moment. These vessels have neither supplemental heavy ordnance or small guns, so that they are dangerously exposed to the attacks of the smaller torpedo boats. The "Huascar's" combat really confirmed what had been taught us in the American war, that the armour in nearly all cases, kept out the shot of guns which were supposed to be able to penetrate it. We have, I think, been misled in this matter by our target firing, which is always at right angles. Such firing could scarcely ever happen at sea, where you could seldom get an enemy's ship so near as the target is from the gun at Shoeburyness, and hence the element of twist would largely affect the penetration, for it is the sharp spin that makes the shot stick to its work after striking; as the distance of flight increases, the rapidity of the shot's rotation lessens, and is in great measure lost at long ranges, and hence failure to penetrate, results even on the shot's striking at a right angle. I have been informed to-day that there is a very able article in "Fraser" on this subject. We know that in the action off Lissa of which it speaks, the shot did not penetrate the armour of the ships they were fired at. In the combat between the "Shah," supported by the "Amethyst," and the "Huascar," of which we know most of the details, there is on the one side, a small single-turreted vessel, a little over 1,000 tons, mounting only two old pattern guns of, I think, about  $10\frac{1}{2}$  tons weight each, but called 250-pounders. With these guns, however, she did nothing. The "Shah," on the other hand, had two  $12\frac{1}{2}$ -ton guns of the newest pattern, and yet their shot failed to penetrate the "Huascar," a vessel of the earlier turret type and covered with between 4 and  $4\frac{1}{2}$  inch thickness of armour, and she was badly manned. Directly this action was known—I hope I am not wrong in referring to it as an illustration of how people come to different conclusions from the same facts—it was said in "the House," that an ironclad ought at once to be sent to the Pacific. But no notice was taken of the fact that the failure was in the gun-power. The "Triumph" and "Inflexible," and all that class of ironclads which were named as suitable for the Pacific, mount only the very same calibre guns as those of the "Shah," of  $12\frac{1}{2}$  tons weight; therefore such guns would not have been a bit more destructive in their effect from being mounted in an ironclad covered with armour, 6 and 7 inches thick. I wish to bring clearly before you, that it was the guns, and not the absence of armour that occasioned this indecisive action, because we are still increasing the thickness of armour, rather than increasing the power of the guns. Captain Colomb has stated in his essay that the relative power of ships can only be fairly considered with reference to cost. This is a very important element; and if we thus measure the power of the vessels of the class I have just mentioned, they certainly fall short, for they only mount  $12\frac{1}{2}$ -ton guns. I am perfectly aware that the "Triumph" class could mount 18-ton guns, and they should do so, but as yet they do not mount such ordnance. In the latter class, that of the "Nelson" and "Northampton,"  $12\frac{1}{2}$ -ton guns form their unprotected central battery, and small patches of armour cover the 18-ton guns mounted at the four corners of this battery. We are told that this arrangement will enable the crews of the  $12\frac{1}{2}$ -ton guns to run under the shelter of the armour of the 18-ton guns when an enemy's ship is passing; but how is it possible that such a manœuvre could be effected in action? But  $12\frac{1}{2}$ -ton guns are not sufficiently powerful, as shown by the "Shah's" firing, and therefore I think that these partially armoured vessels in proportion to their cost cannot be considered efficient. What type of war ships should we then aim at producing? For my own part I feel strongly that all our larger vessels should carry heavy guns, be good cruisers, and be *lightly* armoured so as to cope with any vessels they are likely to meet with<sup>2</sup>. Unless our vessels of war are fitted

<sup>1</sup> Page 480, par. 4, vol. 20, of "Journal of the Royal United Service Institution."

<sup>2</sup> By substituting the curved plating for the 2' plating now on the lower decks of the "Nelson" and "Northampton," as shown at plate 14, page 475, vol. 20, of the "Journal of the Royal United Service Institution," the whole of the battery guns of these vessels could have been of 18 tons weight and protected by armour, with the further advantage gained of an improvement in their watertight compartments. R. A. F. S.



to keep the seas, and to engage anything that they may come across, we really cannot preserve the empire of the ocean and efficiently protect our vast commerce. It is quite true that in the old time fleet vessels or line-of-battle ships did engage with line-of-battle ships, and frigates with frigates; but anyone who looks at the times must see that those days have passed away, for steam has made an entire change in the whole system of warfare. The turbine has been mentioned as a motor. I believe the turbine would be a very important adjunct for moving our vessels, especially those long vessels of the "Minotaur" class, to which the turbine could be easily fitted and used to move their bows and sterns very rapidly. The advantage would be, that while turning they could not be easily rammed, and were they to be so, the vessel ramming would get her own bow twisted by this motion. Mr. Griffiths has shown how to ease the screw, and pointed out how valuable this plan could be made for the discharge of water. His arrangement is in fact a capital turbine. Another point which has been raised is, whether the fish, the Harvey, or any other torpedo is the more efficient. I think they all have different points of excellence which are available under different conditions; but there is another weapon which could be made far more effective than any of them, and that is the rocket. It is as yet undeveloped, but it has these positive advantages over either of the others, that it can be easier handled, has a far higher speed, and the further great advantage that while the others are losing speed, so that striking they would not perforate the bottom of a man of war, the rocket would be gaining speed, and would readily perforate the greater number of war ships. I think therefore it is a weapon that is well worthy of our consideration, more especially as the rocket can be used for firing in the air, as well as through the water.

Admiral RYDER: In offering a few observations on this subject, I propose to run through the various points very shortly, and confine myself to the useful summary the Council have wisely drawn up. (1.) As to "the amount of reliance which may be safely placed on steam propulsion, and on depôts for the supply of coal." Captain Colomb has done great service to the discussion of his paper by his map, which points out the links in that chain which pretty well encircles the world connecting our coal depôts, and it is a question for statesmen perhaps more than naval Officers to what extent this chain should be lengthened. We welcome our arrival at the depôt and take the coal from it, but we have very little influence over the establishing of these coal depôts, although many of us know where they ought to be. It is a question for politicians to decide when and how they can best complete the links of that very important chain. Unless you have those links completed, you cannot well decide what kind of ships you should build now for the immediate future. It is a prominent part of Captain Colomb's argument, and which justifies him in his opinion in advocating a certain class of ship and doing away to a great extent with the sails we have, viz., the assumption that our Government will shortly and promptly complete that chain. It is also an essential feature in his statement that in time of war we shall find it not very difficult to establish relations with neutral Powers who will, he assumes, supply us with coal. I think that is a very doubtful question. It will not be very easy to persuade a neutral, when he is excessively afraid of the other gentlemen round the corner, to be benevolent with you with regard to the supply of coal. I have just returned from the command on the Japan and China station, and with an imminent prospect of war, I felt very doubtful whether I should ever get a pound of coal without taking it forcibly from a neutral. (2.) As to the best means of protecting these depôts there can be very little doubt they must be fortified. Many of them are not fortified at present. I was only the other day at Singapore, and there I do not think there was a single gun in position, although plans were made out by Sir W. Jervois years ago. There is an enormous coal-ing depôt at Singapore for the Peninsular and Oriental Company, also a smaller depôt for the Royal Navy, utterly unprotected, so that an enterprising enemy might run in at night and with a torch set them all on fire. Hong Kong is in the same position, utterly unprotected. Our coal is at Kooloon on the mainland, quite exposed. I read in the newspapers yesterday, that frantic efforts are being made to fortify Hong Kong, but it is rather late to begin to fortify your Colonies and coal depôts when war is supposed to be imminent. (3.) I will not touch upon the "dangers to which our naval empire is exposed" by the Declaration of Paris. It is a very difficult question;

politicians differ upon it, naval Officers differ upon it, and it is not a question I will further remark upon. (4.) Next in order is the old question of "turret *versus* "broadside." There is a modification of the turret which I think might have been alluded to here, viz., the gun mounted on a turntable *en barbette*, and partially adopted, a modification of the turret which I believe will always be found necessary when you come to have very large guns on deck. In such cases revolving an enormous turret safely and certainly, becomes increasingly difficult; a jammed, and therefore disabled turret, would in our largest ironclads reduce the armament by one-half. We have next the newer question (5) of "The relative value of beam and "end-on fire." Captain Colomb attaches much larger importance to the beam than the end-on fire. I ask for both. I am not prepared to give up end-on fire; I would like to have as much of both as I can consistently with all the various requirements of naval armament. But particularly, I think now-a-days we want a powerful STERN end-on fire, for we are exposed to attack from swift vessels that are intended to "ram," coming up astern. When we see such a vessel approaching astern, if we have nothing but a small number (probably of light stern guns), we shall have two dangers to provide against. If we turn towards her, we are in a particularly awkward position for being rammed, and if we keep on, and she is faster than we are, it seems to be inevitable that we shall be rammed unless we can destroy her by fire from the stern guns. Of course if our vessel is a double-ender and has a propeller enabling her to go astern as well as ahead, she will not approach us, but if not, we shall be in a very awkward position if we have not powerful guns to play upon her from the moment she comes within their range. Then (6) as to the question whether *many light or few heavy* guns should form the armament, I think we ought to have both. It is absurd to give us only a few heavy guns and no light guns. We shall often be attacked by small swift vessels, we want in order to meet all comers, a few heavy guns and a great many light guns. (7.) "Whether ships should "be armed to fight only their own or other classes." I think primarily their own, but we should have at least one powerful gun on board each vessel to give little vessels a chance when they are overtaken, as they will often be now, because the small vessels have the least speed (except the new torpedo vessels) and unless the small vessel, corvette, or gun vessel can get a big gun into play she will be run over or captured. In the old days the speed was with the small vessels, the frigates, corvettes, brigs, and they could get away. Now it is with the big vessels, and the small ones are sure to be taken unless they have that chance of disabling their opponent which a heavy gun would give. (8.) "Whether is the gun or the armour nearer its final limit "of strength for a given weight and space," I do not believe we know anything about it. At present we are quite in the dark as to which is ultimately to win.<sup>1</sup>

With regard to the relative value of the ram, we have had many disastrous proofs in the last two or three years of the enormous power of the ram. The Admiral of the Fleet, Sir George Sartorius, deserves great credit for having preceded all of us in his persistent advocacy of the ram; the ram is a tremendous

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<sup>1</sup> "I know that Mr. Barnaby, the Chief Constructor, looks forward to the complete "abandonment in future first-class fighting ships of armour-protection for both "buoyancy and stability."

These are his words, p. 13, 18, 19 of a statement lately printed at the Admiralty, entitled "H.M.S. Inflexible," by N. Barnaby, C.B., Director of Naval Construction.

"With precise experiments, I look forward to the complete abandonment, in future "first-class fighting ships, of armour protection, for both buoyancy and stability. It is "only in this way that the growth of the gun and of the armour can be met; but in "this way it may not only be met but arrested. So long as a single effective blow "by the gun can disable the ship, attempts will be made to produce such guns and "to resist them. With an unarmoured cellular structure for the protection of "buoyancy and stability, and several armoured citadels and communications, no single "blow would disable the ship; and both guns and armour would cease to increase "in size, and the guns would rather be multiplied in number and in shell power.

"Such ships would approach again the conditions of naval warfare before steam "was introduced, when no single blow from the gun, however powerful, could be

weapon, and we know now what prompt mischief it can do, and no doubt in future actions it will be a very prominent means of attack. (10.) "The relative values of the spar, the Harvey, and the Whitehead torpedo." As far as I have been able to study the subject I believe the value of the spar torpedo against a vessel at anchor, unprotected by steam launches, is very great in the hands of plucky men. Its use would have the effect, as it had in the German and French war, of obliging the blockading ships to career up and down off a blockaded port. The French

"expected to be fatal. I repeat that I am prepared for this issue of exhaustive experiments.

"Fighting ships may be divided into two great classes, *unprotected* and *protected* as to guns, buoyancy, stability, and machinery.

"The unprotected ships are of all sizes from the smallest sloop to the vessel of from 5,000 to 6,000 tons displacement.

"In none of these is there any protection against shell-fire except such as may be given to engines and boilers by coal. The ordinary merchant ship, if properly divided into compartments, may be made quite comparable in defensive strength with the regularly-built war ship of the type of the 'Inconstant,' 'Raleigh,' 'Boadicea,' 'Volage,' and smaller ships.

"Of protected ships there are many varieties :—

I. "The ships of the 'Comus' class, *i.e.*, corvettes of 2,300 tons displacement.

"They have an *underwater steel deck wrought over the engines, boilers, and magazines, with a raft body above it.* This is, in virtue of its position as against blows of projectiles, as effective a protection for these parts of the ship as would be given by armour on the sides.

II. "The ships of the 'Warrior' type, *viz.* : 'Warrior,' 'Black Prince,' 'Resistance,' and 'Defence.' These ships are divided into three parts longitudinally. There is a middle division, varying between one-half and three-fifths of the whole length of the water-line, which has a belt of armour on the sides and ends; and there are two end divisions protected by an under-water deck, as in the 'Comus,' but without a raft body. In this respect they appear to me to agree precisely in principle with the designs got out by Mr. Reed in 1869. The 'Resistance' and 'Defence' have a protected part for half the length of water-line, and the 'Warrior' and 'Black Prince,' which are 380 feet long, have armour for only 213 feet. These ships then have, as above stated, three divisions, *viz.*, *side-armoured middles, and protected ends.*

III. "There is the ship protected by *side armour throughout the water-line*, associated either with a short or with a long and continuous armoured battery overhead. In the latter case the ship is said to be completely protected, in the former only belted; but in neither of these cases is there a protecting under-water deck. This class includes nearly all the completed ironclads of all navies, and all the protected ships designed in England between 1861 and 1873.

IV. "There is the ship protected by *side armour on a middle division of the ship, associated with protected ends and raft bodies.* In this division is included the 'Inflexible,' 'Ajax,' 'Agamemnon,' 'Nelson,' and 'Northampton,' the 'Duilio,' 'Dandolo,' the French 'Admiral Duperré,' and the German ships, five in number, of the 'Sachsen' type.

V. "There is the ship with protecting deck and raft bodies from end to end, without side armour, but with armoured batteries, to which it has been understood that the 'Italia' and 'Lepanto' are to belong, but of which there is no actual representative at present.

"In my opinion all ships of 3,000 tons displacement and upwards, should be protected. Those intended for high speed and cruising, and not having large batteries, or many men about the decks, might be well protected either as Class I. or as Class II. The great favour which Class III has received in all navies, and the large number of existing ships of the type, will perhaps cause it to keep in favour for second-class battle ships for a few years more. Class IV must take all



ships hardly ever remained at anchor for the night before a German port, because they did not care to expose themselves to the attack of fast boats coming out with spar torpedoes. As to the Harvey and the Whitehead, I feel very doubtful myself as to their being of any great benefit *at sea*. I went on board the "Thunderer" the other day and saw 15 magnificent machines in a splendidly illuminated store room. They were of the most delicate character, and evidently required as much care as the chronometers. I doubt whether in action any of them would do what they were told to do. I think it is very probable they would do what they were not told to do, and that it would be very awkward for some of us they should do, viz., explode prematurely, or mistake friend for foe. (11.) "Then as to the entry and training of Officers 'and men.'" This is a very large question. Someone spoke just now of the age for entering young Officers. I agree with Admiral Hamilton, that, provided we drew our supply from the best public schools at, say 14, the age for joining, *sea-going* ships might with proper precautions be advanced. It is a very difficult question, but I am of the same opinion as I was some years ago, when the late Captain Goodenough and I read papers here on the education of young Officers. With regard to the training of men I believe we train them well in our training ships, but there seems to be a difficulty in getting them out to their ships on foreign stations after they are trained. I have heard only one opinion on the subject from all the Officers who have commanded the squadron of training ships, Captain Tremlett, Captain Jones, Captain Wilson. I have taken great interest in this important subject for many years and always kept up communications with the Officers I have named who have been in charge<sup>1</sup>, there seems to be an impossibility in connecting the training ships at

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"first-class ships for the future, unless Class V should establish itself, and in that case it is likely to become the permanent type, with general improvements in the manner of constructing the raft and mounting and protecting the guns. If we are obliged to stop at Class IV there may be a greater widening and shortening of the ship than there is in the 'Inflexible,' and both the gun and the armour will grow. If we can happily succeed in passing to Class V we may have more reasonable dimensions in ships and the increase in thickness of armour and in power of individual guns may be arrested."

I feel confident that the readers of the Journal will be well pleased to see what are the views of Mr. Barnaby in 1877, and those of them who read at the time the Reports of the Committee on Designs of Ships (1871), or who now turn to them, will readily recognize in type V the design submitted by the dissentient minority, and pressed on the attention of the Admiralty as fit for prompt experiments. The dissentient minority fully urged this design, the Admiralty draughtsman appointed to assist the officers having certified to its stability.

Mr. Barnaby states, pp. 9, 10, that the "great cost of such experiments and the difficulty of making them conclusive within a reasonable time, caused their postponement."

Surely when the cost of ironclads varies from 350,000*l.* to half a million and more, the necessary experiments must indeed be very costly, and the time necessary to conduct conclusive experiments very great, to justify their omission. It must not be forgotten that it is over six years since the Committee on Designs reported. These experiments on raft bodies, &c., were unanimously recommended for prompt trial.

<sup>1</sup> "We don't recruit our boys in the right way, by the right means, or at the right places.

"We require about 3,000 boys a-year to recruit our 18,000 seamen in the Royal Navy; the Merchant Navy would require about 16,000 boys every year if they were solely dependent on home recruiting and did not rely, as they unfortunately are now obliged to do, on the presence of large numbers of foreigners (over 14,000). 3,000 boys for the Royal Navy + 16,000 boys for the Merchant Service = 19,000. There are more parishes in Great Britain and Ireland than 19,000. One boy from each parish every year would recruit both services. It merely requires organization—the National School Inspector should have the giving away, as prizes, of nominations to the Royal Naval Training Ships. How keen would be the excite-

home with the sea-going ships on foreign stations. When the training of the boys is finished, they are sent to the receiving ships at Portsmouth and Plymouth, and there they have frequently been kept waiting for many months while there has been plenty of room in the ships in foreign stations for them. The only difficulty was how to get the boys out to the foreign stations. On some stations ships come home at very short intervals, on others at long intervals. That is so on the China station,—we hardly ever had a man-of-war going home or coming out, they were re-commissioned out there. The result was there was rarely any opportunity for a man-of-war to bring out the boys. I could never understand why they could not be sent out in the Pacific and Oriental ships, it is merely a question of expense—why 30 or 40 boys should not be sent out under charge of a sub-lieutenant to the East Indies, China, and the Pacific I could not understand. Unfortunately, many of the boys when in these receiving ships in England get into mischief and ultimately, when they come out to the foreign stations, instead of being the capital article they were when they left their training ship, they are partially demoralized and certainly come to grief in much larger proportion than would be the case if they were sent out promptly. In spite of this our men are much improved of late years—the troublesome men form a small minority of the crew, but it is much to be lamented that the desertions are so numerous, and the number of re-entries, after the first term of 10 years, is not much larger; the result is that the average age and *physique* of our ships' companies is much below that of foreign Powers.

There is another point, and that is the composition of our ships' companies. In deciding upon the number of boys required annually to fill up the waste which is the essence of the question, and is now about 3,000, we must look at how the ships' companies are composed, and we shall be startled at the very marked difference between English ships' companies and the ships' companies of other nations. We in the English Navy, as different wants have been created on board, we require more domestics, lamp trimmers, storekeepers, &c., and introduce *landsmen* for the occupation. The French insist upon almost everybody on board being a combatant: he must be a sailor or have been a sailor; he must learn his drills steadily; he must be able to defend himself if he is attacked. We are sliding down the other scale. In the "Audacious" 25 per cent. of the ship's company were non-combatants, they did not know one end of a rifle from the other, and I was forbidden to expend powder in instructing them; these men could not have defended themselves respectably from any French sailor lad. In the "Thunderer" class the proportion of combatants is much less. In the French line-of-battle ship alongside of the "Audacious" at Hong Kong, only five per cent. of her ship's company were non-combatant. How would this affect the result of an action? If those ships had been engaged in combat I know as a fact that she had 100 more combatants than I had, although I had a larger ship and heavier guns. This again is, I believe, a mere question of pounds, shillings, and pence. (12.) As to our "Reserves," I had the honour of commanding our Reserves for three years, and I believe the system is a thoroughly good one. I re-echo entirely what Captain Verney said, I believe the Royal Naval Reserve are a splendid

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"ment in each parish—how proud the parents would be of their sailor boys when they returned after 6 months! Whatever difficulty there might be in persuading shipowners to take the right number of lads in their ships to feed the waste among merchant seamen, there need be no difficulty as to at once recruiting for the Royal Navy its 3,000 boys annually from the rustic parishes. The boys we want are boys with respectable homes and with both parents living—they need not be the best at their books, but they should be the best cricketers, climbers, &c. In fact the Royal Navy should and would have the pick of all the boys of the three Islands, long before the recruiting sergeant had a chance, owing to the different ages of entry. Each of the coast guard ships would have her rural district stretching far to the rear from which she would receive boys. Every boy, every parent, every schoolmaster in the British Islands would know in which training district he lived, and where the Royal Naval Training ship of his district was placed, and what were the qualifications which would earn a nomination."—A. P. R.

body of men. I used to induce naval Officers and members of Parliament sometimes to visit with me the "President," the Reserve Training Ship in the docks, to see the Royal Naval Reserve men at their drill. I never took anybody down but what he was pleased at the appearance of the men: in fact they are the cream of the merchant service; but whether they are good or bad they are the best that are available, and within a very small number, *all* that are available and qualified, and we have none too many of them. I believe we have some 14,000 now, in the first-class Reserve, and a few thousands in the second, also an invaluable body. The Coast Volunteers I believe have almost disappeared, we have also the Coast Guard, consisting of about 4,000 men. Our Reserves, barring that they are much too few in number, are in a wholesome condition, but just compare them with the French Reserves. The French system passes 7,000 fishermen and merchant seamen through the Royal Navy every year, keeping them under drill from 3 to 5 years. The result was this, that, in the war with Germany, they had 70,000 seamen under arms, independent of the marines, and were able to send a splendid *corps d'armée* to Paris that did excellently good service there. I should like to know how many seamen we could afford to send to defend London. We have not got half as many on active service and in the Reserves as we ought to have in order to be prepared for a hot war with two or three European Powers and the United States. They are very good as far as they go, but they are not half numerous enough. (13.) The Naval Volunteer Corps is a useful experiment, with the idea of popularising the Reserves with persons on shore, and I believe they would do right good service in harbour-defence if called out. If we have in the Royal Naval Reserve *all or nearly all* the qualified A.B.s in the Merchant Service, and if, as I mention, the number of seamen and marines on active service, plus the Reserves, are not nearly sufficient to meet the requirements of a hot naval war, it is evident that two steps should be taken, viz.: first, to gradually increase the former, viz., the numbers on active service, commission more ships as required, and then take steps for replacing the foreigners by native seamen by multiplying training ships and inducing shipowners of sailing ships to carry more apprentices.

I should like to say a word or two upon the points your Lordship added to our list as to (14) "Canvas or steam," it is a very large question. I do not see my way until those coal depôts are created, or until I know that the Government have set to work to obtain them, to giving up sail for the second-class ironclads, which would be the flag ships, and the more important ships on the district stations, or to reducing the canvas. But I make Captain Colomb a present of the "Audacious," and all the existing ironclads. She is by no means a ship that illustrates what a second-class ironclad should be. I believe it is within the powers, intelligence, and zeal, never equalled, of the members of our constructive department to design a second-class ironclad fit to be a flag ship on our foreign stations in peace and one of many in war; if they were told that the ship must have sufficient canvas to beat to windward, say a mile an hour in moderate weather, which was as much as the old line-of-battle ships could do—if this were done I have no doubt they would succeed, and in the course of a few weeks give us a good working design, aided by Mr. Froude, who says great beam has no effect in diminishing speed. Mr. Reed undertook to inform the Committee on Designs that he saw not the slightest difficulty in doing this, that he was perfectly confident it was within the power of any naval constructor of intelligence to design an efficient second-class ironclad that should be as good a sailing ship as any wooden frigate we had ever had, and I want to hear from the constructive department "whether they can or cannot accept his challenge;" the moment Mr. Barnaby says it cannot be done, I shall bow my head and say "then I admit it cannot be done." He has not said that yet and I do not believe he will.

With regard to "classification," I have little to say. As your lordship correctly stated the four gentlemen who sent in papers had different classifications, but I am confident if they had the opportunity of putting their heads together, they would, in the course of one day, agree upon *one* classification. I do not believe there is any radical difference between them, or that they would not arrive at a unanimous conclusion if they conferred together on the point. With regard to "duality of propellers, engines, &c.," it is a necessity, but there is a risk in one kind of duality which I believe has presented itself to the minds of our constructors. It is said, our later ships have a longitudinal and almost complete bulkhead fore and aft, with hardly any



opening in it, in order to confine the water on one side only, and thus limit the quantity of water that finds entry into the ship. There is the risk! In many of the monitor class, the ships are remarkably tender, and they reach their angle of maximum stability very early, and if you put a complete or almost complete iron longitudinal bulkhead with no or insufficient communications between the two sides, you may find after the vessels are rammed that they will fill on one side and roll over like turtles. I think Captain Dawson made some remarks upon the seagoing qualities of the "Hecate" and "Gorgon" class. There have been so many Committees, and so much inquiry into the qualification of the various classes of ships, that I dare say that the reports of some of these Committees may have escaped the recollection of gentlemen who perhaps at the time were interested in them. I should like to place on record the opinion of the Committee of Designs (of which my Lord Dufferin was the chairman, and six naval Officers and numerous civilians were members) of that class, As regards the "Gorgon" class, which Captain Dawson so severely criticized, I think the Committee (of which I was a member) went almost further than he did in their virtual condemnation of this class as seagoers. Their unanimous report was this, that "if a certain superstructure extending along a good portion of each side was not put on, *they would be safe to go from port to port only in fine weather.*" That is a very startling statement to make about ships of war. Now that superstructure has not been put on! I do not know why it has not been put on. It is five years since it was suggested by us that it should be put on, and we carefully considered the phrase given above. I remember there was a considerable discussion about the word "*only*," but at last it was put in; and those ships are stamped with this character—that they are in their present condition *safe to go from port to port only in fine weather.* I believe they are now assembled at Portland, and it is stated in the public press, with the prospect of a cruise to *Berehaven*! With regard to the "Turbine," I believe that it is a much neglected propeller, for reasons which would be too long to enter upon here. The poor turbine always had the cold shoulder turned to it. The inventor of the turbine brought it forward; it was put into a man-of-war, the "Waterwitch." The "Waterwitch" was tried and the results were most remarkable. She was tried against two other ships, her sisters, with two screws, and this was the result, as I read at the time, that one went 9·3, the other 9·2, and the third 9·1, and the "Turbine," the novel invention, with all the disadvantage of novelty, gained the intermediate speed of the three. The ships were fairly equal if not identical in all other respects. The "Waterwitch" was put into the steam-reserve, and she has been used once or twice as a gunboat. No other ship has been built to illustrate the principle, but the turbine, I believe, is the propeller of the future, if only it can struggle out of the difficulties which have surrounded it. Surely the fact that the "Waterwitch" when first tried realized a speed of 9·2, and that the turbine alone can be relied on for reversing promptly the line of motion of a ship without turning, cannot be fouled, and has in its engines an enormous pump efficacious in case of leaks and fire, justifies a further trial in a more suitable vessel, with engines better adapted to the purpose.

Commander GERARD NOEL: My Lord, I address you on this occasion, though perhaps it would have been better if I had deferred doing so until later, but I am afraid I shall not be able to attend an adjourned discussion. This is the first time I have had the honour of addressing the members of this Institution. They, however, did me the honour of meeting to discuss an essay of mine two years ago, which I am afraid was pretty well pulled to pieces on that occasion, and I am very sorry I was not here to defend it myself. Now we have to discuss Captain Colomb. Captain Colomb is an old adversary of mine, not that we have entered before into the same contest, but he has criticised my writings, and I have quoted his. To begin with, I very much agree with Captain Colomb on several points which have not been referred to on this occasion. One is the question of watertight compartment; I am a very strong advocate for doing away with all watertight doors; I think they are the most dangerous things that ever were invented. Build your bulkheads up to at least six feet above the waterline, and then your ship will be safe. The German ironclad that was sunk the other day, might have been afloat now if her watertight compartments had been effective.

As regards gun power, I would ask those interested in it to study the first three

tables in my essay. They tend to prove—and I think the data is pretty good—that if you have 1,000 tons of armament to carry in a seagoing vessel, the 9-inch gun is the one you can carry with most effect. There are here shown nine systems of armament, each weighing 1,000 tons; which of these do you intend to put on board a man-of-war? Speaking of them in the essay, I say, “Studying the results “produced in this last table we observed that system 6 (viz., thirty 9-inch 12-ton “guns), can not only throw five times as much weight of metal as system 1 (80-ton “guns), and  $2\frac{1}{2}$  times as much as system 3 (35-ton guns), in a given time, but also more “than trebles the total remaining energy displayed in the same period by system 1, and “doubles that displayed by system 3, even at so great a distance as 4,000 yards.” If you wish to put 1,000 tons of armament into your vessel you could put thirty 9-inch guns, and that would give a result of throwing five times as much weight as system 1; that is four 80-ton guns which would constitute the same weight of armament, and  $2\frac{1}{2}$  times as much as system 3, that is twelve 35-ton guns.

I always have been very much opposed, in my humble way, to a small number of large guns—putting all your eggs into one basket. If your gun is disabled, where are you? If you have a large number of guns, half of them may be disabled, and you have still the other half to fight. You have an extended battery, and though Commander Custance just now told us an extended battery had its faults, and no doubt those faults are of great importance, still you will have with it a reserve of fire; a material reserve of force when part of your battery is disabled.

Another thing is the manner in which I propose the armour should be placed. I would have the battery armour throughout two-thirds the length of the ship, not only so that your battery should be distributed through a great length, and your gun-fire should be effective, but also with regard to the *watertight compartments*. This battery would close in the whole ship, and as what I propose is, only to have the battery-armour as high as the gun-port sills (no armour above that, everything above as light as possible, steel, anything you like, but as light as possible, and of such material as would not make splinters), the watertight compartments would, I say, open into this battery, and you would have no entrance into the bow or stern of the vessel outside the battery part as I call it.

There has been much talk about the “Inflexible.” Now I am very much opposed to her. Her great weakness is, I think, that water may get into the bow compartments after she is wounded. That I consider a very important thing, for when a vessel is water-logged and sunk by the bow she is powerless and at the mercy of her enemy; I would therefore, in the ship I propose, fill in with cork to a considerable height above the water-line, and so let the shots come in as thick as they like through the unarmoured part, and yet no water would get into the ship; a thing to be avoided, especially in the bow. Then another weakness is that the armour-belt in those vessels of the “Inflexible” type does not strengthen the stem for ramming.

Captain Dawson has been kind enough to throw a heavy shot against my coast defence vessel. A 10,000-ton vessel for coast defence I spoke of as a floating fort, and I consider it is very necessary that on our coasts (home and colonial) we should have such forts. Their displacement may be 20 or 23 feet, but the tonnage might be anything—10,000 tons is not too much. You require a vessel that will *hold the sea*. Gunboats will not hold the sea; a gale of wind comes on in the Channel and all our wretched little gunboats have to tumble into harbour head over heels; the gale abates, the enemy comes upon us, and where are we? Our gunboats cannot steam out in time to defend our shores. Now a wholesome vessel of 6,000 or 10,000 tons, with plenty of beam, would hold the sea. I propose that these vessels should be armed with *really* heavy armaments; let their beam be considerable and the armament of the larger vessels be at least twelve 38-ton guns. I believe it is possible: I would place these guns in small turrets which should simply be a cover for the breach of the gun; the turntable would not be more than 15 feet in diameter. You place your gun on the carriage on the turntable and place an armoured cover over the breach. You have twelve of these guns round on a breastwork deck, similar to that of the “Dreadnought,” only perhaps with a little more beam.<sup>1</sup>

<sup>1</sup> I intended describing coast defence vessels, as including in my opinion all mastless ships of present construction, and of giving them the further denomination of

Now for the question of steam *versus* canvas. I find the other three essayists would give up masts or next door to it. I advocate canvas, I think that canvas is necessary; I do not see that science has arrived at that point when it can ignore the elements. I think that if science is really science it will make use of those elements, and the greatest element we have to deal with as seamen is the wind. The wind will blow till the world comes to an end. I see no reason why we should not reduce the top hamper, and for that purpose you might introduce steel wire, steel masts, and introduce steel into your yards; have your yards to brace fore and aft. Let science do that for us, but do not let it take away our masts; it is not time yet. As regards the non-combatants on board I have endeavoured to point out the difficulty of training what I call seamen proper. There is no doubt about it, the difficulty is such that we must keep our numbers under. We cannot train any very large number of seamen. We do not want a very large number of seamen; if we can have 12,000, or I think we have now 12,000 able seamen and petty officers—if we can keep that number up it is all that we want. We must fill our crews up with other people, and we can find use for these men on board every ship, not actually perhaps all of them as landing parties, but still they will be useful for transport, for assisting the ambulances, &c.; but we must keep our numbers of actual seamen in hand. In the last 3 tables I have endeavoured to show you how I propose the men should be distributed. I there make use of our Reserves in case of war, and altogether we can add up over 80,000 men with the Marines and Reserves; the stokers we should get from the merchant service; the domestics and those sort of people I have put down and think will be forthcoming in numbers as many as required.<sup>2</sup>

Captain Long spoke about a double screw vessel turning out of the way in the case of ramming. I think he will find a single screw when at full speed will turn with the helm as fast as a double screw.

Captain CROZIER: In the experimental trip between the "Waterwitch" and the "Viper," the twin screw succeeded in making on the measured mile 10·5 knots, while the "Waterwitch" scarcely realized 9 knots. The "Viper" went to Liverpool and was then ordered, "after some time," to the coast of Ireland, steaming some 2,000 knots. She subsequently returned to England, and made a voyage to Bermuda, about 4,000 knots, under her own sail and steam, where she remained. The "Waterwitch" in smooth water and under the most favourable circumstances was able to make about 9 knots, but having had part of her weights removed and trim altered, she succeeded in making 9·2 knots. On *one occasion* she got into the trough of the sea, off Portland Bill, and her propelling power ceased, the seas washing over her, but *fortunately* they were able to get sail on to the vessel, and in that way she succeeded in getting back to Portland. When the weather was fine she was sent to Plymouth, paid off, and has never been commissioned since. Those facts I think will prove that unless some very great alteration takes place in the turbine, in a heavy sea or with a strong breeze it is absolutely useless.

On the motion of Captain J. C. Colomb, R.M.A., the discussion was then adjourned until the 26th instant.

coast "attack" vessels, for, when our coasts or those of our colonies are free from the danger of attack, from the enemy's forces, such vessels would be at liberty to assume the offensive.

<sup>2</sup> I intended to say in answer to Admiral Ryder, that I would presume to remind him that the system of obtaining men, *ad libitum*, and for short periods of service by "Conscript" gives the French the advantage of us in obtaining and training seamen. It is principally due to this cause, that we find a greater proportion of combatants in the crews of French men-of-war than in our own—G. N.



Wednesday, June 26th, 1878.

ADJOURNED DISCUSSION.

LORD HAMPTON in the Chair.

Captain J. C. R. COLOMB, R.M.A.: My Lord, I feel almost oppressed by the vastness of the ground one has to cover in the very little time necessarily allotted to each speaker to convey his views. I approach this subject from a different point of view to that adopted by the majority of the speakers. The subject for the Prize Essay was "The Development of the Imperial Maritime Force," and that particular word, "Imperial," calls up the particular part of the subject with which I wish to deal; but this Institution is not the proper place in which to do so. If our naval power means anything, it means the protection of our commerce as a fundamental part of the duty of the Navy. When one remembers the rate of development of commerce in other parts of the Empire, and also that at present our naval power is only furnished by one part, that is enough to indicate my difficulty in dealing with this question in the way I could wish. I will just mention one fact to show what I mean. In 1805, the year of the Battle of Trafalgar, when our naval power primarily existed for the defence of our commerce, the sea commerce belonging to the United Kingdom amounted to about 60,000,000*l.* a year. The sea commerce of the United Kingdom, taking the returns for last year, is 655,000,000*l.* a year, and the sea commerce of our colonies is 300,000,000*l.* a year. Now, the broad principle on which I would have wished to have approached this subject is, that if our naval power is for the protection of our commerce, it should have some relation and direct proportion to the different parts of the Empire which furnish that commerce. In 1808 a very remarkable book was written by Sir Charles Pasley, a celebrated engineer; and he points to this fundamental maxim, and hands it down to be practically interpreted by posterity, "that the strength of the British Empire, "separated by long sea distances, is greater or less in proportion to the capability "and ability of the several portions of the Empire affording each other mutual succour and support." Seventy years afterwards we have the Indian troops at Malta, and it is supposed to be a new discovery of our military power. But the naval aspect of the question appears to me not to command the attention it deserves. Those troops are at Malta, and they have moved in time of peace; but when the stress of war comes, and you have to carry out your principle of the different parts of the Empire affording each other mutual succour and support, you cannot do it unless your roads of communication are clear; and it is for the safety of the communication of the ocean and the seas that we must develop our maritime power, and therefore, in the first place, I wish to say that I would rather refer very briefly at first to the defence of our sea roads. The military concentrations of the present day depend upon something more than protection, they depend upon the power of locomotion, and we rely in moving those forces by sea entirely upon steam; therefore the military strength of the Empire at this minute really, putting aside for the moment the naval protection, rests and depends and relies upon steam power. Now come to the next question, the position of the Empire from another point of view. The Empire may really be regarded at this moment as a vast commercial speculation, with its head-quarters in the north-east Atlantic, having laid its money out in various quarters of the globe, and upon the freedom of communication depends the commercial strength of the country which furnishes the means of developing your maritime power. Your greatest commercial transactions are based upon the precision and certainty of your steam communications; therefore my second point is that the commercial prosperity and strength of this country frankly places its reliance upon steam.

That being the case, there is a third aspect of the question, and that is that upon these water roads depends the sustenance of the people at home. I will only give one or two statistics to enforce this: I am dealing with the sea roads, and I wish to enforce that point most strongly. In the seven years ending with 1840, the imports of wheat from foreign sources into this country amounted to 6,000,000 quarters. For the seven years ending with 1877 what do you think the grain imports to this country were? 370,000,000 quarters. Now that is made doubly important by remembering that in England now, as compared with the England of twenty years ago, there are 800,000 acres less wheat grown; and, to sum up shortly, in 1846 the import of corn and flour amounted to 17 lbs. per head of the population; but in 1876, thirty years after, it amounted to 167 lbs. per head of the population.

Our military strength relies upon steam, our commercial prosperity and success depends upon steam,—they have both frankly accepted it,—and the protection of these great sources of our strength rests upon the Navy; and the first general principle I would ask you seriously to consider is, that put forward so prominently in the Prize Essay, and I would ask, is not the protecting power going to put the same reliance on the same agency, as the things and forces it has to protect? That is briefly my argument in favour of our Navy placing a frank reliance upon steam, putting aside all technical considerations.

Now I say that the answer to the question, whether you are going to frankly rely upon steam or not, affects in general principle almost every naval detail. It affects it in many ways; and it is no answer to the advocates of reliance on steam for others who are antagonistic to the view to say that your coal might fail. I say if you are to place, as I maintain from my point of view you must place, reliance upon steam, then the first principle of your naval policy is to take care that your coal shall not fail. If the Empire is anything it is an Empire of coal. The British dominions contain the great wealth of coal which is necessary, and it appears almost to have been destined by Providence to enable them to carry on the operations over these sea communications. I would first allude to one remarkable fact; a colony—a fragment of your Empire—exports at this moment more coal than the whole of the United States of America. I mean the Colony of New South Wales. Therefore, I say, from the natural and geological structure of the Empire you have no reason for being weak-kneed as to your supply of coal. What you have in effect really to look to is to ensure that your naval policy and arrangements shall ensure that you will be enabled to make use of what nature has so liberally provided you with. The argument that your coal may fail may be applied to war operations in a rather startling way. You might as well, to my mind, logically say, “Take care how you trust to “firearms, because your ammunition might fail.” I think the great object of these discussions is to elicit “general principles;” and approaching the question from the military concentration point of view, and the commercial success point of view, I say the Navy must place a frank reliance upon coal.

The next general principle I wish to bring forward is this: you have got to defend your sea road. I do not care whether roads are on land or on sea; there is one rule I defy people to argue down, and that is this, that the primary defence of the roads, sea or land, depends upon the safety of the points which command them, and that to cripple your enemy's roads, the first thing you have to do, is to seize or mask the commanding points. I will not enter into the question of what are the points; they are well known to every member of this Institution; but if that is a general principle of naval policy, let me ask, has it been acted upon? Certainly not. With the exception of the Mediterranean line, and perhaps Bermuda, you cannot point to a place commanding our roads that we have in any sense protected. If you ask nine people out of ten about the command of the sea, they say, “We have a fleet of iron-clads; it is all right; they will protect it.” But I maintain the Fleet cannot protect the sea roads except the points are otherwise secured as well against all applications of a hostile force. That being the case, it becomes a question of naval policy, are those points to be protected by naval or military force? That would open too large a question; but I will limit it to this: are these places to be protected by ships? I say most assuredly not, and for this reason, that the real power of a ship lies in its power of locomotion, and the area over which you can apply it, and if you take that power away from a ship by permanently limiting its action to a particular

point, you are taking so much naval power away from yourself. The object of defending your fixed points is to release your Fleet, and therefore the principle I maintain is this, that it should be a fundamental part of your naval policy, and the development of your maritime power, to adequately defend, by other means than ships, these fixed points. I would, with all respect, say this principle has not been forced upon the attention of this country by naval Officers as I could have wished to have seen it, for I think we should all proclaim, with no uncertain sound, that if the country expects the Fleet to "go anywhere and do anything," it must by other means protect the points that command the Imperial communications. By following general principles I think you come nearer conclusions as to details. You have got this far in your general principles—you must view your naval power pure and simple as the power to keep up the communications between those fixed points, and to prevent their being interfered with by a hostile force. That is a matter of sea strategy; and the first principle of sea strategy is, I maintain, the maintenance of the fixed points by other forces than your Fleet. Very well; now, the main object to be obtained by this movable force that is so released from fixed points, is that it shall have to the greatest possible extent the power of concentration and the power of dispersion. Now, that is the strategical question, and must in a primary way influence your naval policy of construction; and in order to bring a detail such as the "Inflexible" to the true test, you must bring it to the test of the general principle, and ask, does this in itself represent the greatest power of concentration and dispersion with regard to the area over which it has to act? And I go so far as this—that as the object of strategy is "to ensure the right force being at the right time at the right place," the object of tactics is to accomplish the work which strategy requires to be done at these places, and that the tactical development of your Fleet is inferior in consideration to the strategical requirements of your Fleet. Therefore, to sum up shortly, with regard to fighting ships, I submit to the meeting whether we might not have got more daylight into this confused subject if it had been approached in a different point of view some ten years ago. If strategical power in a fighting ship must involve tactical weakness, I would as a matter of sound policy increase the number of ships rather than attempt to gain tactical results satisfactorily in one ship by a sacrifice of strategical qualities. I say with all due respect that when I hear applause brought down by statements that a British ship must be able to fight any other ship anywhere, I confess it always conveys to my mind that great confusion popularly exists between the strategical duties of ships and the tactical requirements which they are to fulfil. In the Army, and even in civil life, as regards land-warfare, strategy and tactics are so understood that you never hear anybody say that cavalry should be able to take an intrenched position.

There is one point mentioned by Lieutenant Hays that I should briefly wish to touch upon, and that is an Intelligence Department for the Navy; and I think the Intelligence Department as sketched out by him somewhat amplified would be of very considerable assistance to naval Officers in grasping what the strategy of the sea in days of steam, means. Sixteen million tons of coal goes out of this United Kingdom annually. Can any naval Officer tell me offhand where that coal goes to? Can you tell me where a fleet, possibly escaping one of our blockades, would be most likely to find coal at any given point and given time of the year on the ocean? Foreigners are not blind to these facts, but there is no Admiralty information to be got. The Admiralty Officers have not time for it, they are not aided by any department whose business it is to collect that information; but I say, on the declaration of war, every commander in all parts of the world should not only know the coal resources actually within his district that produce coal, but he should also know the ordinary channels through which the coal of the Empire is flowing; because it is of the first importance that if you are going to rely upon coal, you should guard not only its source, but the sea lines over which it passes.

I will not enter into the question of reserves beyond saying this,—that I observe, generally speaking, in the House of Commons and out of the House of Commons, in the public press and in this Institution, a misapprehension of the term "Naval Reserves." Now my remark does not apply to the real "Naval Reserve," because that is a force dormant. We pay it, and instruct it, and keep it dormant in peace, but call it out in war. But your other reserve, on which most of your essayists



touch, is the Marine Reserve, and they talk of a 14,000 men reserve for the Navy. Now it is no such thing. No reserve is a reserve which forms an integral part of your active force in peace. Your Naval Volunteers are not a reserve for another reason, because no reserve is really a reserve unless it is geographically unlimited in its application. It must, if it is a reserve for the Navy, and the Navy is liable to serve all over the world, be a reserve which is not hampered by any limitations as regards area. With regard to the Marine Reserve, you have not 14,000 men, because 7,000 are actually an integral part of your peace fleet; you have only 7,000, and you will find that those 7,000 men are not all educated—that only a small portion of them are. You call the Marine Artillery a naval reserve of 3,000 men; why, you have 1,300 of those men serving in the Fleet, and they must be struck out of the reserve. Then you come to head-quarters. You take your staff, your sick, and your uninstructed, and what do you find? Why, that the Royal Marine Artillery Reserve for your Navy is at this present moment only about 450 men. When you look at the whole list of the Marine Reserve as a reserve for the Navy, I hope that will always be borne in mind. Your marine infantry and artillery, taking non-effectives and effectives, which gives so small a reserve result at the present moment, is a reserve which actually costs one-eleventh of *your whole naval power* as nearly as possible; it cost about about 960,000*l.* last year. If you take the reserves and test them by what the essayist has pointed to as the relation between cost and power, I think it will lead you to some very curious conclusions. Your men are reserves in the Marine forces, but your Officers in the Marine force are not, they are not naval Officers, and they are not capable of performing duties on board a ship of a purely naval nature. How does this arrangement actually affect you? At this moment you are spending 16,000*l.* in half-pay to naval Officers (Commanders), because you have no room for them on board ships, and you are paying 16,000*l.* to Officers of Marines and Marine Artillery on board your ships, and you cannot employ them when they are there. I do think that discussions of a nature covering such a vast ground can only be satisfactorily approached from the sure, certain, ground of general principles. The last gun, be it remembered, at Trafalgar closed a series of practical proofs, and the first gun fired in naval war will open a series of practical experiments, and the result of those experiments will depend upon the correctness of scientific forecast. You may measure in peace the value of scientific forecast when, and not till when, you have *fixed* your general principles. No matter how gallant, how able our naval Officers may be, the supremacy of our Empire in the next war will stand or fall by the true or false application of general principles. Success will depend upon how far the British public and the naval Officers adequately and really comprehend the *principles* upon which we must rely in the next naval war.

Captain CYPRIAN A. G. BRIDGE, R.N.: I ought to apologise to the audience for rising so soon after Captain J. C. Colomb, an Officer who for many years has given so much attention to this subject, and whose name has been so long associated with the most careful consideration of the very important matters which are dealt with in the various essays which have been sent in for the gold medal. I do not hope nor intend to deal with general principles in the same exhaustive and eloquent manner that he has done, but I propose to confine myself to a few remarks upon the Essays and chiefly upon the Prize Essay. The real question asked of the Officers who sent in their Essays was, "How to secure a powerful and economical Imperial Naval Force." Therein lies the great question in which all the others are contained. Strange as it may seem, I am of opinion that that question has been practically very satisfactorily answered in this country—at all events of late years. I do not mean to say that there is no room for improvement, nor do I mean, for one moment, to cast any doubt upon the truth of the remarks which Captain Colomb has given utterance to; but, as I said before, I think in practice this question has been fairly well answered already. I have no intention of dwelling upon the subject, but I will content myself with saying (what any one can verify for himself), that the country is in possession of a force certainly equal, and probably greatly superior to any which any conceivable combination could array against her; and that at a cost not exceeding one-half of that to which the members of such combination are collectively put. Our naval budget is less than half that of the naval budgets of the Powers of con-

tinental Europe put together, and our fleet is very nearly as strong, if not stronger, than all the fleets which continental Europe could equip. I do not bring forward figures because there is nothing easier than, by consulting books like the "Almanac de Gotha," "Whittaker's Almanack," and others, to see at once how true this is. You will find the number of ships, the number of guns, and even the number of men is not much inferior to the number of each which the continental naval States keep in their pay. In addition to that, there is the enormous reserve of power of our vast coalfields, and of the immense manufacturing establishments belonging to private industry which the country contains. I think this fact should be occasionally called to mind in this country where criticism of the naval administration almost invariably takes a turn unfavourable to it. Still, there is no reason for not being fully impressed with the importance of the subject, nor is there any reason for saying improvements cannot be made. I had scarcely read more than a page or two of the Prize Essay, before I was struck with the excellent account of England's position and of the change in that position since our last naval war, which has been given by the essayist. It seems to me there is one paragraph deserving of the fullest consideration—a consideration which unfortunately it rarely has obtained in this country: he says, "a blockade at a distance," by which, I think, he means the cutting of our lines of supply, "is more to be feared than actual invasion." There can be no question in the mind of any one who considers this subject fully, that actual invasion, which we are so frequently guarding against, is far less to be feared than the cutting of some of those great lines of supply for the protection of which we have hitherto done so little. But, I think, Captain Colomb in his Essay takes rather an inadequate view of the duties of the Navy as a defensive force; he is inclined to regard it as a purely *defensive* force—so I understand it. I do not think he has given in the paper sufficient weight to the rule that a *defensive* defence, to be an effective one, should be an *offensive* one. So that the view of a navy's duties in war, which he takes in his Essay, seems to me to be somewhat too narrow. I think we may very safely lay it down, as a rule, that the Navy should be able to attack as well as to defend, and to attack with a view to the destruction of an enemy's forces. Unless we do that, I do not see how any naval war is ever to come to an end. The wars of the present century have proved one thing, if nothing else, and that is that such a thing as the financial exhaustion of a country does not necessarily make a war terminate in a very short time. That was proved, I think, by the example of the American contest, and has been corroborated by the contest which has recently closed in South-Eastern Europe. So that, if we are simply to lock up the squadrons belonging to an enemy in their ports and sweep his commerce from the sea, letting our own trade go on as if there was no war, the probability is that the conflict, the uncertainty, and all the indirect, if not the direct miseries of war will continue, if not for ever, at all events for a great number of years. The proper duty of a naval force, especially of a powerful naval force, and one which is able to hold possession of the sea, is to pin the enemy down to certain places, to establish a military blockade of his fortified ports, and then, when there, to do its utmost to destroy the fleets which have found shelter within. In the late Crimean War our enemies were kind enough to do that for us themselves; but I very much doubt that we shall ever find that they will do so again. That what was done at Sebastopol by the owners of the splendid fleet which sailed from it will ever be done by any nation again, is far more than we can hope for, and therefore we must rely upon such power as we have to destroy the enemy's fleet ourselves, and so place it at the conclusion of the war in the position in which our antagonists in that contest were good enough to place themselves. I also still think that home defence, coast defence, harbour defence, are no unimportant part of the duty of a Navy, even so great and powerful as our own. A naval war is very likely to last at all events more than a few weeks. If we adopt the system of sending our heavy fleets abroad to pin the forces of the enemy in his naval ports, we, to a great extent, leave our own coasts denuded of a mobile defensive force. Now, I see no reason why some unkindly, some non-benevolent, neutral may not intervene in such a contest, may not see that now is his opportunity to do us incalculable damage, he may intervene with a rapidity which steam power places him in possession of, and he may be in so short a time upon us that we may not have sufficient opportunity to prepare for his reception. A harbour,

coast, home defence by naval means seems to me to place this country on a level, and, taken in combination with her sea-going fleet, upon more than a level with the great military Powers of continental Europe.

With respect to the policy which the essayist suggests should be made use of towards the smaller Powers, such as the minor Republics of America, I am inclined to think it is a mistaken one to rely almost exclusively upon a coercive policy. In the first place, supposing the whole of the States of North and South America were neutrals, if we attempted to apply coercion to the Republic of Chili, Peru, or Central America, I am disposed to think we should hear something about the Monroe doctrine from the United States, and I am also inclined to believe the Empire of Brazil would join in and follow the lead given at Washington. The policy to be adopted in such cases, I think, is to provide beforehand by certain international rules or points of international law, whichever we may please to call them, for these contingencies, and to make it the interest of the smaller States not to injure that Power which, being the greatest commercial Power in the world, is of more use to them than any other. It may seem an odd thing, but the two great questions, one of which has been settled comparatively lately,—the “Alabama” question, and another question which was settled some twenty-eight years since, against which we only began to exclaim two or three years ago, that is to say, upwards of twenty years after it had been settled, the Declaration of Paris; the settlement of those two questions, I think, has placed our mercantile marine, as far as regards any attacks being made on it from neutral ports, in a far better position than it ever has been before. Consequently I am of opinion the coercive policy, which I take it is suggested—

Captain COLOMB: No.

Captain BRIDGE: I am glad to hear that correction, because it seemed to me such a policy, and it is a policy which, if not advocated in this Essay, is advocated by many other people, would not only be an unfortunate one, but it would not be necessary. If the Prize Essay had no other merit than this, this alone, in my opinion, would entitle it to the highest praise, and that is that a law is therein laid down which establishes a relation between the strategical requirements of the Navy and the strategical capacity of the individual ships. Having first examined what it is that would be required of our ships in different parts of the world, the essayist has then laid down this law: “We thus see that the propulsive power of a war ship “must be regulated by the geographical conditions of her service;” and we find the propulsive power of our war ships may be governed by a uniform law. If the Essay had contained nothing else, it would for that reason alone be worthy of the highest praise, and deserving of the fullest consideration at the hands of naval Officers. Until some such law as that is considered established and binding upon the people who are responsible for providing the country with ships, we should be going on for ever in a blindfold and groping way, gradually adding a little coal-carrying power to this ship, and taking it away from that, and should be apparently never approaching nearer the settlement of the great question, how best to fulfil the strategical requirements of the British Fleet. I should not have time to go into the various details concerning ships which have been dealt with in the Essays; but it is satisfactory to see that there are several points upon which all the essayists are agreed, that one I mentioned just now, as to the coal-carrying capacity of the ships, they appear to be agreed upon; they also appear to agree that ships of the enormous and unwieldy size, such as have hitherto been built, should not be repeated, and in that they are at one with some of the most distinguished naval architects of the Continent. They also appear to agree with Captain Colomb where he says, it is an error to suppose that guns of 80 tons and upwards are the guns of the future. I do not think any one of them proposes a gun of anything like that weight; 38 tons as an exceptional weapon, and guns of 18 to 20 tons, seem to be those which find most favour with them all.

One observation concerning the sixth paragraph of the last chapter: “Coast and “harbour defence should occupy in the British Empire an entirely subordinate “position.” With that I agree, the position should be subordinate, but not altogether left out; “and the best defence of naval stations is the defence of the routes “communicating with them.” Now I am inclined to think, and I rather interpret the remarks made by the last speaker as confirming me in my opinion, that the con-



verse of that is the case ; that the best defence of the great lines of commerce is the defence of various points on them, and we should be rather beginning at the wrong end if we were to attempt to defend the lines instead of attempting to defend the points to and from which these lines led. It is almost impossible to carry out a complete supervision of any greatly extended line, and the only way of doing so effectively, either on shore or afloat, is by selecting certain important points and defending them. I believe a great deal has been done in this way of late, and that the attention of the country has been turned more to the defence of these points than has hitherto been the case ; and we should find, I think, if we were suddenly engaged in any naval war, that more systematic arrangements have been made to defend many of the important positions that dot our trade routes than the public in general is aware of. The Institution, I am sure, has done good work in directing attention to this subject, and the thanks of every member of the Institution are due to the Council for having given this as the subject of the Essay. I am sure also that the country, if it cared to take any notice of naval questions, would regard its security as improved if it only knew what intelligence and ability its Officers, as shown in these Essays, have brought to the consideration of the matter.

Lord ASHLEY : My Lord and gentlemen, I am loth to take up the time of this Institution with any remarks on my part. We veterans, who feel a great regard for the Service that brought us up and made men of us, although we left it some time ago, would much rather come to meetings of this sort and hear speeches from Officers on active employment ; and nothing more proves the great advantage of institutions such as these than to find you, my Lord, an ex-First Lord of the Admiralty, in the chair, and gallant Officers from every part of the globe coming to join in these discussions, and giving their practical and experienced views on everything connected with such a large subject as my friend the Prize Essayist has placed before us to-day. But having heard with great pleasure from two gallant Officers the praises of a body of men I have the honour to command, the Naval Artillery Volunteers, I feel myself bound to say a few words, and let this meeting know a little about them. I am delighted to find my friend in his paper distributes to that force the very duty which I have always urged they are most peculiarly adapted for, which is that of a naval torpedo force : and that opinion is also shared by another old brother Officer of mine, Captain Arthur, of H.M.S. "Vernon," at Portsmouth. These are men always on the spot. They have a certain amount of intelligence. I am proud to say I command a force where every man, instead of getting a capitation grant, pays a sovereign a-year for the honour of belonging to it. That is a point which ought to be considered in their favour as an economical force. They devote themselves entirely to learning the duty of seamen gunners ; and though they are like the Marines, not obliged to be sent aloft, yet for mere pleasure they are quite ready to go aloft and furl sails at a moment's notice. There is another point of view in which they would be most useful, that is, as coastguardsmen. I have two detached batteries, one at Brighton, and the other at Hastings. They are all young men of the place ; some well-to-do tradesmen, some clerks, but they are all most accomplished boat sailors, and in case of war those men might perfectly well relieve the coastguard ; they would be always on the spot ; they could, more or less, be looking after their own affairs while they were doing coastguard duty, and would be most intelligent signal men. Those are the sort of men I have the honour to command. I think the country ought to be very proud of their services, and there is no country but England where such a body of men would be found to devote their time for nothing to the service of their country. I am talking to you, my Lord, as a man high in the councils of your country, and who held one of the greatest positions in the English Government, and I will say while I am addressing you, right well have you filled it ; therefore I will say that I do think that facilities ought to be given as much as possible by the Government to allow these young men to perfect themselves in the duties of their profession ; they are most eager, most anxious to learn everything. I have had several applications from my Officers to be allowed to go through a short course of gunnery in the "Excellent." Of course a short time ago I was met by the objection, "It cannot be done, because we have not got such a "thing as a short course;" but now when greater facilities (and I am very pleased to see it) have been given to all classes of Officers to go through a month's course of

gunnery in the "Excellent," I certainly think a way might be found by which my young Officers might be able to learn the whole of the ins and outs of the duties of their profession. It is a great thing for any country to have such a body of young men; though their services may not be required, still they leaven the country; they accustom the people of London to see young men dressed as bluejackets, voluntarily and without pay, subjecting themselves to discipline, and our discipline is stricter than that of any land volunteer force. I am perfectly certain if their services were ever required they would come forward to a man. No gentleman here can at all appreciate what I felt at the previous discussion on hearing two gallant Officers speak so highly of the corps, because we do try to do our best, and from the smallest bugler to the commanding Officer, our great endeavour, our only pride and boast, is that we are ready when wanted to supplement the naval Service. There is no injudicious swagger about us at all; we simply want to do our duty whenever and wherever it may be required.

Captain PRICE, R.N., M.P. : In the few remarks which I shall offer to the meeting, and in view of the very excellent rule imposed upon us by the Council, that we shall limit our remarks to ten minutes, I would venture to confine myself entirely to that part of the subject which deals with the type of our ships. It would be invidious on my part to say that that part of the subject is more worthy of attention than any other, especially after the very satisfactory speech we have just heard from the last speaker; but I think at all events I may say that if any practical results are to follow from the Essays which have been put before us, they are more likely to be found in this question of the type of ships. When I say that, I do not speak of it from a naval architect's point of view, but from the general principles which should guide us in selecting the type of ship. And I say that for this reason. Naval architects have very justly complained that we naval Officers do not tell them what it is we really want. They say: "Tell us what it is you want. Tell us what results you want to gain from the ships we are to build for you. Tell us the general principles which are to govern us, and then we will put all this into detail, and produce any kind of ship you choose to ask for." Following the hint given by the first speaker, I shall confine myself to noticing one or two general principles which are to govern us in this matter. I notice Captain Colomb in his Prize Essay said he was rather afraid he was going to startle some of us. I do not myself see anything at all startling in his suggestions. I think the whole Essay was based upon a due and proper appreciation of the altered circumstances and necessities of modern warfare.

Foremost then amongst these general principles is that of "*steam versus sail*," because we must get to that first of all. Are we to have sail power in our ships, or is that a thing which is not absolutely necessary? That ground has been so well covered in the Prize Essay, and also by the first speaker this afternoon, that I will not go much into detail about it. But there is one great objection which is raised in many quarters to the doing away with sail power that I think I ought to notice, because, although it has a good deal of a sentimental nature, yet I beg leave to think it is one of the strongest objections which is raised to doing away with sail power, and that is, that many Officers of the old school say, "If you do this—if you do away with sail power in our ships to such an extent as is advocated, the consequence would be you would very much deteriorate the seamen of the Navy, and it is their seamanlike qualities upon which England has relied in the past, and must in the present and in the future." I entirely disagree with the opinions of those Officers. To my mind the seamanlike qualities are not engendered so much by those wonderful extravagancies which so many Officers are so fond of, the crossing of the top-gallant yards, shifting over of stun-sails, reefing of topsails, which are very pretty and useful in their way, but which are better suited for the ship scene in the opera of *L'Africaine*, or as accompaniments to the gyrations of Zazel at the Aquarium. If any one doubts that, I ask them to look to those services where seamanlike qualities are to be found in the field, for instance, to the crews of our small coasting craft, pilot vessels, fishing boats. There you will find sailors to perfection, men who are imbued with all the qualities we want to find in our seamen, activity, pluck, plenitude of resource, and in fact all those things which go to make the seaman proper, that is to say, an individual who on the

sea is thoroughly at home. Now if we are to allow that we may with safety and efficiency do away with sail power in our ships, of course that principle will very much depend upon the efficient carrying out of what Captain Colomb calls the principle of duality in our ships. That of course is a good deal a question for naval architects, but if we only tell them we do not want sails in our ships I will be bound to say that principle of duality will be perfectly well carried out in the ships they are to build us in the future. Now if this principle of duality is necessitated by the altered circumstances of the case, I think it is also very much necessitated as regards our ships and the guns which those ships carry. Perhaps I should be speaking more correctly if I said the principle of duality should be enlarged into the principle of plurality. I think most essayists have agreed it is more essential, to say nothing of the economy of the thing, that we should have a greater number of ships of great strength rather than a smaller number of ships of exceptional strength. One reason why I think this, is that in any invention which may crop up in the future, or in the development of those inventions which are now a matter more of experiment than anything else, we are in a better position to take advantage of that advance in science with a larger number of ships than we are with a smaller number. For instance, there are some modes of attack which are applicable to small ships quite as well as to large. There is the mode of attack with the ram. Every one will allow that two ships costing 250,000*l.* apiece will be much more able to meet an enemy with that weapon than one ship costing half a million. It is the same principle in the development of torpedoes. For a given sum of money we can get more ships capable of using those weapons; we can get a better development of them than we can out of one ship which costs the whole sum. Some have said it is absolutely necessary if other countries come into the field with exceptional ships we must meet them with ships of the like nature. I do not think that is at all the case. I notice that Captain Colomb in his lecture does not allow that that is the case. The proper way to meet exceptional ships of that type is by torpedoes or by gunboats, or rams, and so forth; but it is not at all necessary that because Italy comes into the field with a "Dandolo" that we should put a vessel afloat of the same kind but perhaps of superior armament. I see there is a slight difference of opinion amongst the essayists about the necessary number of guns. Captain Colomb, Commander Noel, and Lieutenant Haye all go in for a large number of moderate sized guns in preference to a few guns of very heavy kind. Commander Noel in his Essay says: "What must appear clear to everyone is that moderately heavy guns can "be carried in greater numbers, can be fired with greater rapidity, and are nearly "equal in range and velocity to the heavier ordnance," and he gives us a very useful table of the comparative value of systems of ordnance, which I recommend to the attention of anybody interested in this subject.

On the last occasion Commander Custance said he did not approve of having so many guns on a broadside as six or greater numbers, and he gave certain very excellent reasons. He said he did not think the means of firing broadsides had been sufficiently developed. I wish to notice that, because last year in this theatre I made one or two remarks upon that point; I did not think, I said, that our means of firing guns in broadsides, either by electricity, or in any other way, had been sufficiently developed, and that it required more attention. I was to a certain extent criticized by a gallant Officer, who said he thought this system had been very much further developed than I was aware of, and that as a matter of fact very good practice was got out of electrical broadsides. The other day Commander Custance told us in his experience that was not the case, and I am rather inclined to think he is right, but he only confirms me in my own opinion, that it is above all things necessary that we should develop this power of firing a great number of guns at any given object efficiently. I think all the guns in a battery ought to be capable of being laid, without the slightest doubt, exactly as one gun, and I believe it could be done by our gunnery Officers, with the help of the naval architects, and those people whose duty it is to put the guns on the decks of our ships.

So then as to the principle that we must have more guns in our ships than we are in the habit of placing, I would like on every ground to say the least number of guns we ought to have in a "fleet" ship at the present day should be six on each side. But if this principle is allowed it will decide several questions. One will be



the question of turret *versus* broadside, because it is quite clear that if we are not to limit the size of our guns, we must at all events limit the number of turrets that are to carry them. You cannot put more than a certain number of turrets into a sea-going ship, and therefore you cannot get the number of guns on a broadside which I hold is necessary. Then there is another question, that of armour *versus* guns. It is often asked, have we reached the limit in this respect? The other day two celebrated Officers both told us that they could not answer this question; they said, "We must refer you to the civil engineers." I do not think that is at all a satisfactory state of things. In fact I go further, and I say I do not think it is a correct answer, because I do not think we ought to leave such questions to civil engineers to decide. It is for *us* to decide. No one can be more competent to decide such a question than naval Officers. If they say that they must go on increasing the size of their guns, then it is for the civil engineers to go on building guns as large as ever they can, and here of course there will practically be no limit at all; but if we tell them that what we want, rather than size in our guns, is number, and the better chance of hitting our enemy, then we shall have answered the question by stopping this extraordinary growth of guns, and limiting them to guns of an ordinary size. I should myself like to say that a good gun of 25 tons is quite large enough to put on board our ships, and I think the size of our ships and the size of the guns might well be limited by the number which I proposed just now should be put in them. I would say every ship except the very small ones should carry broadsides of at least six guns. I should like to say a word or two about harbour defence. I think the principle laid down by Captain Colomb in that respect is a very excellent one. We do not want large ungainly ships to defend our harbours, because in making these large ships for harbour defence I think we go on rather a wrong principle. We presuppose that we are going to be attacked in our harbours by large fleets from the enemy, that is to say, that there is to be a regularly planned system of attack upon certain of our naval ports. I do not think that is at all likely, and if it is we must meet such attack, not in our own harbours, but out at sea. What we want harbour-defence for is, to stop the predatory raids of "Alabama" vessels. No doubt in war with a great naval country such vessels would be sent out of all kinds; they would dodge about round our coasts, pop into one harbour and then another, and get what they can; but the way to stop such vessels is not by ships of the "Glatton" and "Hydra" class; we want swift ships, of light draught of water, and especially Thorneycroft torpedo boats, and also a regular system of harbour-defence by stationary torpedoes.

Lieutenant SYDNEY M. EARDLEY-WILMOT, R.N.: I feel it somewhat presumptuous on my part, in the presence of so many distinguished Officers and civilians, to offer any remarks, but I cannot help rising to express an opinion as to the award made by the referees on the various Essays submitted to them. In that award I entirely concur; and although an unsuccessful competitor myself, I do not see how any other decision could have been arrived at. I have never read anything with greater interest or pleasure than the Essay of Captain Colomb, not for the various types of ships that he recommends, for there my opinion is at variance with his, but for the general method and way in which the whole subject is treated and worked out. As regards the question of turret and broadside, I think it must be conceded the "Devastation" will be considered the most powerful ship in the Mediterranean squadron, and if she is considered the most powerful ship in the squadron, she is the best type of those existing of a fighting ship. She carries a heavier broadside, has a greater speed, and is able to turn or move with greater facility than any other. I served seven months in Besika Bey, with very nearly the same squadron, and it was the opinion I arrived at from experience of the evolutions of the fleet. As regards the number of guns on a broadside, I am of opinion a few guns of great weight are preferable to a large number of smaller size. Of course therein my opinion is at variance with that of the writer of the Prize Essay. The value of well directed bow or end-on fire seems to me insufficiently recognised. There are numerous circumstances when a well directed bow fire is most valuable. For a case in point, just previous to attacking with the ram, *it* may have the effect of disorganizing the enemy, and *by* creating confusion allow us to attack with the ram with advantage, in the same way that on land we disorganize the enemy with

our artillery fire, and then give the order to cavalry to charge. Something of that nature is what I mean in speaking of the advantage of a well directed bow fire.

Another point which I think is not sufficiently recognised is the ability to move and turn with great facility in a small circle. It conduces to safety in ordinary navigation in a great degree, and would be most useful in a fleet action. I think there is not the slightest doubt if the "König Wilhelm" had been able to answer her helm with readiness, she would never have sunk the "Grösser Kurfürst," because as was told me by an Officer who was on deck at the time of collision, the engines were stopped, and the helm reversed some seconds before the collision took place. Had she been able to answer her helm with rapidity, the disaster might have been averted.

As regards the question of masts, I think anybody who has an opinion in favour of masts for a purely fighting ship will see the *disadvantages* of them by comparison between the "Neptune" and the "Dreadnought." They are both lying alongside one another, the "Neptune" a masted turret-ship, and the "Dreadnought" a ship similar to the "Thunderer." In the "Neptune," we have very heavy masts and rigging, which would circumscribe the fire considerably; they are liable to jamb or stop the turrets, and foul the screw in case of being shot away, to say nothing of being less economical in time of peace in proceeding from one place to another, and also decreasing the amount of coal carried. One of the chief advantages of mastless ships, like the "Thunderer" and "Devastation," is that they carry almost four times as much coal as the masted ship: the "Devastation" carries 1,700 tons, while the "Hercules" and "Alexandra" can only carry 500 or 600 tons as the outside amount. That, I think, is a very important thing, and when we were in Besika Bay, the "Devastation" sometimes had to supply coal to other ships.

As regards torpedoes, my remarks may seem somewhat biassed, as that is the branch of the service in which I am employed, but I think their importance in future naval operations will greatly depend upon the manner in which we train our Officers and men in their use during peace time. That training we endeavour to make as thorough as possible, and we do not fear comparison with any nation in the world. But torpedoes cannot be considered otherwise than as auxiliary weapons, on account of their limited range. A weapon must take its rank according to its range, and we know the most effective range of any torpedo we have at present is about 400 yards, that is to say, a man would not probably feel justified in projecting a Whitehead at a greater distance than that. It is therefore a submarine projectile, with a smaller range than any other projectile, but with the power of doing infinitely more damage if successfully applied. But they must be considered an important item, offensive and defensive, in maintaining that national supremacy which we require, to use the words of the First Lord when on board the "Warspite," "to insure liberty, trust, and good faith throughout the world."

MR. SCOTT RUSSELL: I should consider it a serious neglect of duty if I did not express my gratitude to this Society, and my appreciation of the labours of those essayists, whose works I have read with great pleasure and profit. I only desire that we should draw all the profit from these Essays which they can yield us, and therefore I have looked over them with the view of seeing in what we can all agree. Now I think we can all agree in the first proposition which is laid down, namely, that we ought to construct our fleets on some systematic plan previously laid down. Secondly, that the Government, once having laid down a plan for the construction of an efficient fleet, should not from whims and caprices be afterwards changing their system from day to day and from year to year. Our attention is carefully drawn to that by Captain Colomb in the following passage:—"England never has yet, and never will be, sufficiently long under the dominion of a single set of minds to carry out a grand scheme of preparation for war in its entirety." "Not a single ship should be built which did not designedly occupy her place in the great scheme of preparation for war. It may be said that these things are not compatible, but I hope to show that we should have to submit to very slight inconveniences in peace time after all, while we gained the much greater object of being ready when war came." Now I am sure you all feel with me, that if our Legislature, so well represented in this room, could be prevailed upon to lay down a systematic construction of fleets for the defence of this Empire we should have gained an enormous advan-

tage which we have not yet gained, in the systematic completion of a fleet. Captain Colomb begins, we must observe, by trying to give us the elements. What are the elements? The first I agree in entirely,—“Let there be four classes of ships, and “only those four.” Now, what is the advantage gained by keeping the four classes of ships. It has not been developed here, and therefore I will venture just to suggest what you gain by four classes of ships. Suppose ten ships of a sort go together in a fleet—we will say there are ten of each class, 1, 2, and 3,—mark the result. If class 1 are all the same sort of ships, with the same kind of manœuvring, how admirably these ten will work together, and how badly they work together if they are of all sorts. Next, if you made this law that these ten ships that are to manœuvre together had all their spars and fittings identical, all their guns identical, all their ammunition identical, and if they had all the parts of their engines and their screws identical, look what a treasure you would have, and how each could draw upon the other when you get into difficulty. Now I am afraid that is one of the things which Captain Colomb meant when he said that “England never has yet, “and never will be, sufficiently long under the dominion of a single set of minds to “carry out a grand scheme of preparation for war in its entirety.”

The next point in which he has done a great deal for us is to say how much fuel all our ships shall carry. He has given us the measure of the fuel in the performance of a given number of miles. He says, “the minimum number of miles for “which any one of your four classes should be fitted is—what?—5,000 miles.” Now I think he quite understates the speed for which you should be provided. He says if you provide your ships with fuel to make them do *five miles an hour*, you do enough. Allow me to say that I have had occasion to construct fleets for special purposes, one of those purposes being that they should keep the sea in all circumstances; and what have I found? I have found that if you do not supply them with efficient means for a maintenance of an average of *seven knots* performance you are not fit to keep the sea. I do not think he has given us the fighting speed. I wish he had said what is the one speed at which all classes of ships shall be able to come together, and chase the enemy, or engage the enemy, or perform the manœuvres which are necessary in those circumstances which render extreme speed necessary. I think in cases of extreme speed being necessary that the ships should be able to do one speed, and my opinion is you ought to be able, by wasting fuel for a very short time, to catch your enemy by doing fourteen knots. It is a wasteful speed, but do the fourteen knots at the time when it is wanted, and it won't be wasted if you catch your enemy.

The next point on which he and the other essayists have gone a good way to produce uniformity is this, where you say what guns you want. Now I have often discussed that subject here and I will not discuss it to-day, but I am very glad the result of the discussion and of these Essays is to say, we want in every ship a much greater number of guns than we have got at present. They all say that. Then they all say that a greater number of moderately weighted guns is worth a great deal. I wish they had said that guns of larger diameter to carry more powerful shells and to project them with greater velocity and with a lighter weight of gun were also necessary, but I dare say they thought of that when they talked of reducing the weight. Another most important point is this:—I entirely agree with those who say that a broadside of six guns on each side is the smallest broadside we should carry. It gives you twelve broadside guns. I am also of opinion that a ship of considerable size ought to carry four bow guns parallel to the keel for the purpose mentioned by the last speaker, pointing forwards, and perhaps a couple pointing aft, would be enough for the purpose. We have now as a minimum, as the result of this, something like sixteen or eighteen guns. The “providing of duplicates” I think of so great value that I do not think I need say a word more in its favour. Let everything be duplicated, and, if possible, let as many of the fleet as you can, *be alike*. There is one point on which I beg to say another word. Great manœuvring power has been mentioned as a point of very great importance. Allow me to say I think great manœuvring power a matter of the very highest importance. The manœuvring power of many of our ships is contemptibly bad, and the case of the destruction of a German ship is a good example to us to avoid sending ships to manœuvre together when we know beforehand that they cannot manœuvre safely.



Now I never, as a practical man, suggest or recommend anything out of my profession, unless I thoroughly know beforehand that it is to be done and how it is to be done: therefore allow me to say that if you wish it, there is no difficulty in making the manœuvring of all your ships take place twice as rapidly as it now takes place, and without any inconvenience whatever, only first you must wish it. I think these are all the points which may be said to concern a ship-builder and an engine-builder, and I would merely add in conclusion one word as the construction of engines. I think you should insist on two things: first, that they should be able to give the highest possible speed at the moment of an engagement; and I recommend that to you for this reason, that the same kind of engine which will give you the highest possible speed with the greatest extravagance of fuel at the critical moment when you want it in an action, is precisely the same as the engine which will when you do not want this extravagant speed and are not prepared to waste this coal, give you the highest economy of fuel and standard of performance.

Admiral SELWYN: While giving all my admiration of their labours to the authors of the Essays that have been written, I confess I fail to appreciate a great many of the arguments therein brought forward. To some points I can give my thorough assent, but on others I fail to see that the arguments which the Officers have brought forward are such as would have been brought forward by them did they know things which are known and can be known to others. One of the things which I am very much disposed to doubt in view of two recent examples of large ships breaking down at sea, and having to be towed in, is the doing away with sail power. I do not like doing away with sail power. I *should* like to do away, to a very large extent, with the resistance offered by the masts, and also the dangers arising from the possible fall of the masts during an action, but there is no difficulty, I think, in doing that without sacrificing sail power. I have worked out the resistance due to the masts and yards, and the resistance due to the rigging. The area of resistance in a first-class ironclad due to the masts and yards alone is about 600 square feet, just one-third of the total resistance, the rest being all due to the rigging. All engineers will bear me out in saying that there is not the smallest necessity for rigging as you understand it; that masts can be properly made to stand perfectly well, and to carry all the sails you require, and yet to offer very little resistance, and to require no rigging as support. You can thus materially reduce the total resistance—I am taking the highest resistance, of 60 lbs. on a square foot, which is that due to a gale, and that gives 53 tons total resistance, *i.e.*, 2,000 square feet  $\times$  60 lbs. = 120,000 lbs.—we can take it down to one-third of that, which is very much less, instead of getting an opposition which would nearly neutralise the effect of the screw in the very best ships. I think the highest I have ever known as to the calculated performance of the screw is a push of 53 tons; it can be brought down to one-third of that; and as we need not expect gales of wind of the force of 60 lbs. on a foot every day, I think it is only fair to calculate it about 30. Take that as the average, and then I shall be able to show to the satisfaction of those concerned that the economical work done in the many years of peace during which the Navy goes about the world is much more worth consideration than has been assumed if you give proper sail power, but if you give jury masts you had better take them away altogether. The instant you begin to diminish the real area of sail which ought to be present in order to propel a given well-shaped ship with the proper velocity, you ought to do away with masts altogether, and trust, as has been said, frankly to coal. Auxiliary sail and auxiliary steam are both fallacies in war ships. Why do not I trust frankly to coal? Because you cannot as yet impress the public mind with the fact that we are wasting half our coal. I have been in vessels that burn 1 lb. of coal per indicated horse-power for 13 years past: land engines have been working steadily and constantly with  $\frac{3}{4}$ -lb.—why do you not do it? The thing has been recommended by a Boiler Committee, ordered to be tried by the Admiralty, and yet petty obstacles are allowed to intervene, and to prevent such economies as that from being carried out. The instant you get that economy, the reason for your systematic defence of routes disappears, and you get to the true forms of the defence of routes by large numbers of war ships with a high speed, maintained ordinarily with but little expenditure of fuel, and capable of being doubled the instant you chase or go into action, without danger to your boilers. That is the thing to go for, an eco-

nomical boiler, a boiler that won't blow up, or if it is partially destroyed by shot that won't hurt you ; a boiler that you can press up to 250 lbs. on the square inch as a regular thing, and that you can go up to 500 lbs. with, and still remain within one-sixth of the bursting pressure. Then comes the question, what are the ships with which you propose to convoy such vessels as carry your corn supplies from America—vessels of 16-knot speed. You may say let them go slower, so as to keep pace with the convoying ships. You will thereby increase the cost so much that the whole of your carrying trade will go under another flag even without the Declaration of Paris. But unless that is considered, you are talking in the air when you are talking about defending your commerce. Under the Declaration of Paris the experience of all the late wars tells you distinctly what will happen. The instant you declare war, the fleet of the weaker naval Power goes into its harbours and remains there. The commerce which was under your flag, as in the case of the American war, goes to a neutral flag, not because it has any real fear of being taken, but because the insurance rate has gone up in every market on the war flag. You are perfectly powerless to prevent that, and if you choose to abandon the old principle that the way to preserve your Empire is to distress your enemy at sea, where alone you are powerful, you may begin to think how soon you may get rid of your navy altogether, for it ceases to have an object. The object of the existence of a navy is not merely to fight, but to protect the commerce of this country by insuring it to the flag, and to it alone. Your exports have dwindled till you are no longer able to pay for the food you import, except from the returns of your carrying trade, how are you going to protect this commerce on which you now live—that is the question? It is bootless to think of making types of ship when no one can tell the type of engine, gun, or boiler, that you ought to adopt ; when daily science is giving us such new and great facilities in this direction, that to make great classes, would be to make great mistakes.

The "Iris" and "Euryalus" were calculated for very high speed cruisers, but unfortunately they have failed to give the ordinary results due to their horse-power, obtained in ordinary cruising ships. No doubt we shall get rid of that by improving some of the details ; but it is only by following day after day the improvements of each of such matters in detail, that we can ever hope to arrive at perfection, and science has gone so fast lately that it requires no less than to be watched from day to day. If you thought you had a good gunboat and torpedo boat yesterday by following Thorneycroft's valuable discoveries, you may find to-morrow he has led you perfectly wrong, not in launches, but in torpedoes, and that there are means quite available for you by which you may strike a ship not at 400 yards, but at 1,000 yards, and at one-tenth part of the expense, in one-tenth of the time, and with almost absolute certainty. All these things must be thought of and worked out, and before that is done, it is in vain to rely upon any general plan, however thoroughly systematic. Captain Colomb very well states that the cost of a ship and her efficiency ought both to be taken into account before we arrive at any conclusion as to the value of a particular type. If it be said that we must do away with masts, and must have the greatest number of heavy guns with the least draught, with the greatest power of resistance to shot, and the greatest unsinkability, these are not the types of ships you want ; you must go back again. I have here the calculations for a ship which can carry sixteen 80-ton guns, perfectly defended against even the 80-ton gun itself, on a 16-foot draught at 16 knots per hour. All this is to be done by following out the new dicta of science, not by following types which even their builders confess to have been mistakes, types not one of which can go to sea with the original weights which were calculated by her builders on board.

A MEMBER : Might I ask the tonnage of the ship to which you refer ?

Admiral SELWYN : 11,593 tons. I am speaking not of my own ideas ; I am taking Mr. Elder, a well-known and thoroughly reliable ship-builder, who is, unfortunately, no longer among us. There is a ship of 180 feet diameter, 16 feet draught, and 11,593 tons. She requires no width of armour ; the edge of the vessel can be protected with 24-inch armour, and the deck of the vessel with 4-inch armour at an angle at which no shot can strike her with effect. The bottom might equally be protected with 4-inch armour over an area 20 feet wide from the edge towards

the keel, and she can go into 16 feet water, which makes her a proper, well-devised coast defence ship, better than any fort, as of course instead of screws she had a hydraulic motor, as Mr. Elder proposed. She is thoroughly fit for our friends of the volunteer naval artillery to go on board to exercise their skill near the coast, while she could also go to sea and do very good work in moderately good weather.

MR. SCOTT RUSSELL: You mean a circular ship?

ADMIRAL SELWYN: I mean a circular ship. I do not mean to say Mr. Elder would not have gone further than a circular ship had he lived, but what he did appreciate is the power which a segment of the sphere gives us of capacity and steadiness, and which the turbine gives us of keeping a ship above water, however damaged, and steering in any direction without a rudder. I think three of the essayists distinctly say that there is something in the hydraulic propeller which we have not got anywhere else. Is there any reason why at least this Institution should not be in possession of the records of the real sea work of this turbine propeller? I do not know any. I believe it would be greatly for the benefit of the whole profession that we might appreciate those causes which in the very first large application of the system, gave nearly an equality to the screw propulsion which has been under consideration and improvement for the last forty years. If we had a leak thirty feet under water of ten square feet, we should be able, with 1,300 horse-power, to keep the water from entering that ship at all when she was at rest. If the leak was aft and she was kept going, of course there would be less water to enter, and *vice versâ* if it was forward. When I tell you that by the adoption of boilers which can be worked to double their ordinary pressure, you could at once double the power available in such a crisis as that, I think we have some good sound ground for serious inquiry, and that we ought not to be content with forming ourselves into a Mutual Admiralty Society and saying everything done was done as well as anybody else's. I do not like that line of argument, it is one which would put a stop to all progress. We have tried the double screws, which I was the first to call twin-screws in my advocacy of them with Captain Symonds at the Naval Architects' years ago, and they have done well; but I now say we can go further and do better. Why do we not do so? Because everything is kept long in the background that does not square with ideas generally accepted. Our business is to bring forward views which, though good, are not generally accepted: and if an argument put forth in this theatre cannot stand the fire of discussion, I am quite sure it is not worth listening to for a moment.

THE CHAIRMAN: I trust I shall not be presuming too much upon this meeting if I request leave to touch as briefly as I possibly can on some of the remarks and observations that I have heard in the course of this discussion. I almost feel, as a landsman, I am guilty of something like presumption in desiring to do so; but, as you know, I have taken from natural taste and official position such deep interest in naval affairs for many years past, that really I almost feel as if I was entitled to do so. I cannot refrain from expressing my very great pleasure at finding this Institution devoting its attention and its energies to promoting such admirable discussions as these are. I think it is impossible for professional gentlemen—men of eminence in their different walks—to assemble here together to discuss these Essays, and to express their opinions, without great national benefit, and without to a great extent achieving what I presume really to be the main object of such meetings as these, viz., as far as possible, to arrive at practical conclusions. That is the real value of such discussions as these. I confess that there are some points connected with this great and important subject that I am sorry not to have heard discussed rather more fully. I should like to have heard more about torpedoes. They have been adverted to by the able writer of one of these Essays, Mr. Eardley-Wilmot. I think Captain Price also briefly adverted to them, but I confess I should have liked to hear more about these torpedoes, which I think it is quite evident will become shortly an important element in all our naval warfare. Another point I should like to have heard a little more about is the value of the ram. It was rather wittily said to me the other day, after that dreadful accident off Folkestone, that at all events there was some consolation in finding that we were not the only nation that ran down our own ships. Notwithstanding this remark, and notwithstanding the unfortunate fact that there has been some reason for that remark, I think we must feel here about the ram as much as we do about the torpedo, that it will form a very important element



in naval warfare hereafter; and I confess I was glad, and I think every one here was glad, at our last meeting to hear from the high authority of Admiral Ryder, a tribute so justly paid to that venerable and gallant sailor, Sir George Sartorius, as being, I think we might call him, without exaggeration, the originator of this valuable element in naval warfare.

There is another point that has been scarcely touched upon. I find in Captain Colomb's Essay this sentence:—"Not a single ship should be built which did not distinctly occupy her place in the great scheme of preparation for war." I think this is a valuable dictum in which we must all entirely concur, and it leads me to that question which has scarcely been touched. It seems to me an important question—the classification of our ships; and I think after the way we have been going on year after year, trying fresh experiments every year, it does seem to me the time is coming, if not come, when we ought to come to some understanding about what the ships really are to be. Really I cannot help remarking I am rather struck with an expression which to me is a novel one (I do not know whether the Admiralty has sanctioned it), but Captain Colomb, in his proposed classification, and I think some other of these essayists, describe one class of our ships as "fleet" ships. Now whether the Admiralty have sanctioned this term I know not, but if I may speak as an unlearned landsman, I think the term "fleet" ship no doubt will be perfectly understood in this room by naval Officers, but I am afraid out of doors you will find 99 men out of 100 will think when you talk of a "fleet" ship, you mean a ship that can go very fast through the water. That will be the inevitable conclusion out of doors, and I confess I cannot see why we should not call our grand ships of the first magnitude line-of-battle ships, as in former years.

There is, again, the question of "coast defence" and "harbour defence," and here it struck me that there was a little confusion between those two things which do not seem to me to be identical at all. It seems to me that coast defence is one thing, and harbour defence another, and that for harbour defence you will inevitably require a large class of ship, not equally appropriate for what I should call coast defence.

I was heartily glad to hear so high an authority as Commander Noel saying, without any contradiction, and I hope there is none intended, that the training of our sailors never was so good as at present. That is a most gratifying statement, and if it is to be accepted, as I hope and trust it is, then you come to a most important practical conclusion. The same thing with regard to the Naval Reserve. I was very glad to hear the very high terms in which Captain Verney spoke of our Naval Reserve. It has been laid down with emphasis that we must think of attack as well as defence. I thought the remarks we heard on the former day were very sound and good, that the object of all our ship-builders, and of all our efforts on this subject for a considerable length of time, have rather been too much in the direction of considering how we were to be safe in our ships than in considering how our ships were to cause destruction to the enemy with whom we have to grapple.

There is another question raised to-day which I confess I was very glad to hear discussed, namely, the great question, are we to abandon canvas? I was sorry to hear so high an authority as Captain Price speak in such decided terms, that sail power is obsolete, and I was very glad on the other hand to hear my gallant friend, Admiral Selwyn, take an opposite line.

When I came into the room I heard Captain J. C. Colomb give us statistics of the number of millions of quarters of corn that within a given number of years had been imported into this country, and I really for a moment thought I had come to an agricultural meeting, and that instead of the question how we were to plough the sea, we were considering how to plough the land. There is, therefore, one question I should like to ask Captain Colomb. He says there were 370,000,000 quarters of corn imported within seven years. What proportion of that corn imported came under canvas and what proportion came under steam? I do not think myself (I confess I speak ignorantly) but I have a very strong impression that we cannot afford to do away with sail power. I should be very sorry to think the day was coming when we should attempt to do away with sail power, and I see no reason why in this respect we should not look to the continued use of both canvas and steam. They both have their value for the purposes of commerce and war.

You will find the steam engine must be maintained, and I hope and trust the canvas will be maintained also.

I will not detain you longer, but before I sit down I will once more congratulate Captain Colomb on the success of his very able paper, which has been in fact the text for this very interesting discussion, and call upon him for his reply.

Captain COLOMB, R.N.: My Lord and gentlemen, had I not been called upon I should have considered that at this late hour of the afternoon silence would have been golden on my part; but having been called upon, I feel I must respond to the request of the Chairman, and I shall endeavour to confine what I have to say to as few words as possible. As Lord Hampton addressed us before my remarks came forward, I think it is only proper that he should have first place in my reply. The term "fleet-ship" is in no way authorised by the Admiralty, so his Lordship was on quite firm ground when he objected to it. It is my own term. I am fond of short words, and so far as I can see we refuse to re-adopt in the Navy the term "line-of-battle" ship. It has gone out, and there seems to be no power of getting it in again. We want a term which will express shortly and clearly that for which the present ironclad is meant, that is to say, to fight and sail in a fleet, and such a ship I had called a "fleet-ship." But it will not be such a misnomer, because at the present moment these ships are the fleetest ships, and I suppose will remain the fleetest ships we have; so that I hope, if the term holds, the "fleet-ship" will be represented in both senses.

I was much struck by the distinction the Chairman drew between coast defence and harbour defence. I am not quite sure that I ever thought about it exactly in that light before, but I think it is a point we ought to turn over in our own minds to see whether it is not one which we have been rather missing out. As to the *offence* and *defence* of the fleets, when I say our Navy should be defensive, I mean defensive in the sense that it should be capable of resisting attack; that is to say, its business is to keep the sea clear, to fight on the sea, and that its greatest defensive power will consist in its offensive power. What I mean to say is that our Navy should not be devoted to make attacks upon the enemy's land, and that we should not throw away money in making attacks upon the enemy's coast in using the Navy as a directly attacking force, because the only way in which history shows how a real injury can be done to the enemy's coast is by the Army, and that the Navy is usurping its place when it takes that office. I am quite certain I and my brother essayists have felt very much flattered at the way in which the speakers and the Institution have received our efforts. I very strongly confirm what Admiral Hamilton said as to the value of these Essays. It is not alone the value of the Essays themselves, but that the writers of them benefit themselves and indirectly benefit the country afterwards. They take views of subjects and acquire information which, if they did not write these Essays, they would omit to do.

I must confine myself in what I have to say entirely to the material questions. It would be impossible for me to enter into the numerous heads and to make no division of the subject. I will cut off altogether the whole of the questions relating to *personnel*, and will touch nothing except the question of *matériel*. The whole of my scheme from the beginning is founded upon my brother's writings and upon his conversations with me, who, some twelve years ago I think, put this view of general naval policy into my mind. It is known to most of you how much he has written on the subject, and I am perfectly certain my Essay never could have been written, had it not been for the broad statesmanlike principles he laid down. I have merely followed in his footsteps and put into naval form the part of his scheme which really belongs to the Navy. We naval Officers, when we lightly form and lightly utter light opinions, often think it does not matter. Now the youngest of us has an influence on the acts of the Admiralty. Everything done at the Admiralty, everything done by the naval architect, whom we so roundly abuse, has come from us in the Navy; and if the naval architect makes mistakes, and if the Admiralty in their administration make mistakes, it is from the active service of the profession that those mistakes have originally arisen. The Admiralty (and I am quite certain I am right in saying it) initiates nothing. Everything which is done at the Admiralty, every movement made, comes from the pressure of the active service, and therefore the opinions expressed in this Institution have a weight which is not usually credited

to them, because its effect is silent and underground. But the weight is there, and the results come forward sometimes in places and shapes which are most unexpected to us.

My friend, Captain Dawson, opened the discussion with his usual vigour. Now there are men who might object to a strength of language which, in his case, is merely an association of a strength of intellect which has been known to me for something like thirty years; and therefore, however strong his language might be, I could never listen to it without getting some good from it. He found fault with me for misquoting history. Well, at the time of course I submitted to the lash and took my snubbing in the best way I could; but I was bound to see whether I was really making a mistake or not. The question was, whether I was right in stating the "Harbour Defence Idea" built the "Cyclops" class. The speaker said that in point of fact the "Cyclops" class was built to go out into the Atlantic to fight a battle and come back again. Captain Dawson mistook on that point. I have been to the Report of the Committee on Designs to ascertain what the actual facts were, and I find that Captain Dawson was mixing up the "Thunderer" with the "Cyclops" class. The "Thunderer" class, the "Devastation," "Dreadnought," and so on, were built for that exact purpose.

Captain DAWSON: I specified the "Glatton."

Captain COLOMB: I will take the "Glatton" in. The words are these as to the "Cyclops" class, and the "Glatton" is included:—"The first ships of this kind designed for the Admiralty were the 'Cerberus' and 'Magdala,' the former for the defence of Melbourne harbour, and the latter for the defence of Bombay harbour. With this latter is associated the 'Abyssinia.' . . . The 'Cerberus' and 'Magdala' are sister vessels, and the new 'Cyclops' class are almost identical with them." Then the Constructors go on to say—"We therefore consider ships of the 'Cyclops' class and the 'Glatton' are fitted to defend harbours and rivers on the coasts of Great Britain, and to make passages from port to port in favourable weather. They may possess greater sea-going qualities than these, but with our present experience we are not able to satisfy ourselves that they do." All I want to say is, if we now condemn this class of ship, we did not condemn them when they were built. We asked for this particular defence ship. We were mad about the American monitors, and from our vague ideas in the active service, sprang those ships which we now condemn. But whether we condemn or do not, there is one thing quite certain, which Sir Walter Raleigh said for us:—"And to say the truth, a miserable shame and dishonour it were for our shipwrights, if they did not exceed all others in the setting up of our Royal ships, the errors of other nations being far more excusable than ours." And that is just as true at the present moment as it was 298 years ago. When Captain Bridge advocated harbour defence, I think he omitted the question of cost; and the question of cost is one I always wish to impress most strongly. It is not a question whether you shall have harbour defence, or whether you shall have sea-going ships, but the question is, given a sum of money, when the Admiralty meet to discuss the estimate, when the first Estimate Board meets (I am not in the secrets of the office, but his Lordship would correct me if I am wrong) I have no doubt whatever that either in the shape of *pourparlers* or of sitting to discuss round the table, the first question is "How much will the Chancellor of the Exchequer stand this year?" Therefore, invariably, when you come to questions of naval policy the first thing is the money. [The CHAIRMAN: There is another question, what shall we do with it?] After you have got it, the question is how much can you afford to spend on each kind of defence? As his Lordship says, what are you going to do with it? It is not any use to say "We will have both." You must be content with one. Lord Hampton very strongly condemned my position that the steam must take the place of the sail. Now, I know very well indeed, and I very much feel that the proposition is very largely condemned, both by statesmen who have had to do with the Navy like his Lordship, and also by my brother Officers on the active service. I know quite well that for the time I am looked upon as rather a dangerous innovator, but that question was discussed in full here the other night when I read a paper in order to prepare for the present discussion, and then Sir Spencer Robinson gave up *in toto* the idea of sail power for the ironclad.<sup>1</sup> The essayists

<sup>1</sup> See "Journal," Vol. XXII, No. 96, page 530 *et seq.*—Ed.



have done the same thing, and a great many speakers have also done the same thing. I do not at the present moment know anybody who, when pressed upon the point, says "keep the sail power for ironclads." How much further it may be carried I cannot of course pretend to say. It was my duty in writing the Essay to carry out a distinct principle for the purpose of eliciting discussion, and I do not feel that I am distinctly bound to say—if other facts come before me I cannot say—we will not keep the square sails for certain classes of ships. I can only say that those facts are not before me now. Now, in these things, when a point has come to the surface, if you have the right ground, it is surprising how you get confirmation. Now we had confirmation in the most recent experiment of war we have had, the action between the "Amethyst," the "Shah," and "Huascar." We have the despatch of the Admiral in command of the ship. She is a full-rigged ship, where sail power has reached its highest development, and she is in that very part of the world where I do not quite see how sail power is to be done away with. Now, what is his trouble? He says, "The 'Shah's' coal supply getting short, now began to be a *serious consideration*, but trusting to getting some coal either at Pisagua or Iquique, the two ships at once started for the latter place." That is to say, apparently, *they quitted their chase of the "Huascar" in chase of coal.* I do not think it would be possible to put forward anything stronger in confirmation of my views than that. These views have been gathered from an investigation of the results of 50,000 or 60,000 miles travelled over by three of Her Majesty's ships, the "Audacious," an ironclad, the "Egeria," a single lifting screw sloop, built specially for sailing, and the "Hart," a twin-screw sloop. The "Audacious" total gain on the credit side without anything to the other side, was only 7 per cent.—she only got 7 per cent. advantage from the use of her sails—the "Egeria" only got 25, and the "Hart" 26 per cent., and they got that high percentage because it happened that they ran for 8,000 miles each of them before a strong fair wind. If they had had as much wind against them as they had with them, their further progress showed the fall would have been down to 5 per cent. Admiral Hamilton in a former discussion gave the answer which seemed decisive. He said, "I was in a ship, I got on shore, and had to throw the whole of my coal overboard to save my ship. Where would I have been if I had not had my masts and sails to get back to the harbour with?" The answer is, "You would have simply kept the weight of your masts and sails on board in the shape of coal, and could then have steamed away to your port." It came to the same thing. Captain Crozier spoke of the necessity for sail because of his experience in the "Waterwitch." I never proposed to do away entirely with the sail power. Captain Crozier in the "Waterwitch" would have had, I think, the auxiliary sail power which he used.

When we come to the question of "turret *versus* broadside," you get an answer which I must say I always feel uncomfortable about. You get the general reply from the naval Officer, "I want both." There, I say, is the trouble! We ought not to make that answer; we ought to think it out, and to say for ourselves which of these two things is the best, because both you cannot have. There are, of course, immense numbers of questions involved, many of which have been discussed. There comes the relative advantages of beam and end-on fire, and also of many light and few heavy guns, which have been discussed, but the point again is, supposing a man says, "I must have my end-on fire"—several speakers have gone for it—the question is, "what are you going to give up for it?" In the "Audacious," you gave up 100 tons for that purpose; you would have had the same number of guns on the broadside under the same plating for 100 tons less weight. The question is not will you have broadside or end-on fire, or both, but what are you prepared to sacrifice? Is it worth 100 tons weight? When you have only 300 tons of guns, are you going to add 100 tons to your weight for the purpose of putting two of those guns to fire in a line with the keel forward, and two more aft?

MR. SCOTT RUSSELL: Certainly; add another 100 tons of buoyancy to the ship.

Captain COLOMB: Then you immediately come to the money question. We have again the practical experiment of the "Shah" and "Huascar," but it has hardly been adverted to in a way to make it useful. Now what happened on that occasion? The "Shah" and "Amethyst" fought the "Huascar" at

distances varying from 300 to 1,900 and 2,000 yards. Now the "Huascar" had two heavy guns, and the "Shah" had two heavy guns. The "Shah" had also 16 heavy guns of a smaller calibre than either of the "Huascar's" large ones, or the "Shah's" large ones. They fought for  $2\frac{1}{2}$  hours. At the end of that time (comparing all the accounts that have come forward) I find that this is the measure of the damage done to the "Huascar." She was hulled by four 9-inch projectiles, and two 7-inch; she was struck in various places by eight others, of various calibres; four went through the funnel, therefore you could hardly say she was hulled in that case. This leaves you nine shot which struck her, and of course some of the 64-pounders, but they are not specified, and there is no means of ascertaining whether the abrasions of the iron were due to the broken pieces of shells, or to projectiles directly fired at the ship; but numbers of them were certainly ricocheted. She was, however, struck nine times, and practically she was not much hurt; she had one man killed and one wounded. What was the expenditure of ammunition over that piece of business? The "Shah" fired 241 shot, 32 9-inch and 149 7-inch shot and shell at the "Huascar." The "Amethyst" fired 190 shot at her! Now, on the other hand, the Admiral expresses surprise and thankfulness that the "Shah" was not struck by the "Huascar's" shot. The "Huascar" appears to have fired eight times at her. Now considering that out of 431 projectiles only nine took effect on the "Huascar," I do not quite see that it was a matter of surprise that no shot out of eight struck the "Shah." These are the actual facts and figures of the case; there is no question about it; I have taken out the figures myself. But I want to guard myself against one thing which I know will be said to-morrow. It will be said, "You are throwing a reproach upon the gunnery of your own ships." No; I am quite satisfied the gunnery of our ships is the best gunnery in the world, and I have no doubt everything was done that was right in both those ships of ours on that occasion; but here is the strange part of the business, that the percentage of shot which took place is nearly the percentage which I stated some years ago in this Institution would take effect. The articles in the papers when the news of that action came home were strong in expressions of surprise how little had been done. I said, "About 2 per cent. of your shot will strike your object in action," and there is the whole thing. But now the point is, what good (after all said and done on this particular occasion) were the "Shah's" two heavy guns to fight a ship not of her class, an armoured ship like the "Huascar?" And that goes to support what Captain Price, and what I am glad to find most people who have gone some distance into the figures with me come to, that practically one or two guns are not much good in any case whatever, that the inaccuracy of fire is so large an element that it is not much use having so few guns, and that unless you can show a broadside of some six guns, you do not get much value. You cannot do much with it, your shot is thrown away. And then you come, of course, to a something definite about this question; when you can get at the percentage of hits, and when you can make an equation between what number of hits you are likely to make, and what number of guns you can put on the broadside, to make up for the deficiency of the number of hits.

The classification of ships which his Lordship pointed out was one of the most important parts of the whole matter, and yet has not been fully brought out. But the difficulty really is, that there is so much to speak of. I won't say one word about the classification, because I have really said all I have to say, in the paper itself.

Reverting for a moment to the question of the few heavy or the many light guns, and going to that further question, should a ship be armed to fight one of her class, or to fight every other ship, I was a little surprised to hear Captain Scott take the latter view, because I do not think it is one that is coming to the front at present. I think naval Officers are beginning to understand that that is not so; and I think if we imagine the "Shah," armed with two or three heavy guns, an unarmoured ship on purpose to fight a ship like the "Huascar," meeting another "Shah" of her size with three or four times as many light guns, I think we should feel that the "Shah" was not properly armed, because the very first action between those two ships would utterly defeat, destroy, and demoralize the "Shah" with the few

heavy guns, while the "Shah," with the many light guns, would have become triumphant. It would have been no disgrace to a ship to have been beaten off by a ship that she was not intended to fight, but it would be a lasting and burning disgrace, and destructive to our prestige, as it was in the American War, if she were beaten by another ship of her class. The people of this country would not go into the details of the nature of the guns; they would find the ship was of a certain size, and of such and such a class, and if she was beaten, there would be the same outcry that there was in the American War.

We have to thank you, my Lord Hampton, for taking the chair. I am quite sure the service is grateful to you, and the Institution especially, and I am myself very grateful to you for the keen interest you have shown, and for the appreciation you have manifested by your personal remarks, showing that you have thoroughly grasped the points that have been laid down.



# LECTURE.

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Friday, April 12th, 1878.

LIEUT.-GENERAL SIR GARNET J. WOLSELEY, K.C.B., G.C.M.G.,  
&c., &c., in the Chair.

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## ON THE INFLUENCE OF BREECH-LOADING ARMS ON TACTICS, AND ON THE SUPPLY OF AMMUNITION IN THE FIELD. PART I.

By Colonel EDWARD CLIVE, Grenadier Guards.

IT is about six weeks since I was asked to read a paper in this Institution upon the breech-loader and its requirements.

In looking up the subject, it presented itself to my mind strongly in two ways:—

- (1) The helplessness of the arm when short of ammunition.
- (2) Its formidable properties in attack and in defence.

The first subject, then, for consideration was the supply of ammunition, which entailed a comparison between our system of supply and that of Continental nations.

The second was the value of the arm as a means of attack; but as this could not be fixed without considering also the rifle with which the enemy was armed (which must be assumed as good as the weapon of attack), I found myself unable to proceed without considering the tactical formation in which such an arm could be best approached.

While so engaged, I read and re-read many works upon the last German war, as well as critiques and reviews in French and German newspapers, which served to confirm views upon tactics which I have for some time held.

Feeling, however that these views might be dissented from by many, besides necessitating a comparison between our organization and tactics and that of other nations, which would require more time than I could conveniently spare, I still hesitated to bring them forward, even as personal opinions; but upon reflection I determined to do so, for the following reasons:—

Many of the works that I refer to, such as those of von Scherff, von Boguslawski, von Verdy du Vernois, and of the late Captain May, have been translated into English, and are not only largely read throughout the Army, but are largely quoted by distinguished officers; and even form text-books at our military schools, colleges, and academies, and the arguments and views advocated in those works are now used in the daily newspapers. Under these circumstances, I think it better that the questions under consideration should be fairly raised, if possible, in a Military Institution such as this for discussion by professional Officers, than that they should be fought out anonymously in the public prints.

I have therefore availed myself of this opportunity of submitting my personal views on these questions, in the hopes that, if the Council of the Institution can spare another day after Easter, I may be allowed to conclude the subject, and we may have a worthy discussion upon the great questions of the day—a large or small tactical unit, and the best form of attack for Infantry.

It will simplify our discussion if I state at once the framework of the lecture.

- (a) I shall first inquire into the elements of a good fighting formation, and show their bearing upon the size of the unit.
- (b) Examine the character of modern fighting in order to ascertain the part the unit has to play.
- (c) Quote passages from German and French Field Exercises relative to the instruction necessary to render the unit efficient and capable.
- (d) Consider our own attack formation.
- (e) Give examples from the campaigns of 1870 and 1877.
- (f) And from the above deduce the four conclusions which I submit as the basis of discussion, viz.:—

With reference to the size of the unit,

- (1) That we require a smaller one than the battalion.
- (2) That the most convenient size is one 200 strong: and, with reference to our attack formation,
- (3) That it is unadvisable to elaborate any fixed drill for the attack of battalions of the first line.
- (4) That the only instruction relative to the attack, in peacetime, should be that of general principles combined with study, practice over varied and strange ground, and the criticisms of experienced Officers.

Although I do not expect to make any converts, I hope that at all events the evidence which I shall bring forward will be considered sufficiently pertinent to justify me in raising the question at this Institution, and in directing the attention of Officers to these matters.

a. If it be not considered too elementary, I will occupy a short time in explaining the tactical difficulties of elaborating a good fighting formation.

I commence by assuming two principles to start from:—

- (1) The front of extension or attack formation shall cover the front of the battalion in line; and

- (2) The attack shall consist of three parts, skirmishers, supports, and reserves, in the following proportions, viz.:—

Skirmishers	..	..	..	$\frac{1}{4}$	battalion.
Supports	..	..	..	$\frac{1}{4}$	„
Reserves	..	..	..	$\frac{1}{2}$	„

And as we may fix the battalion at a strength of 800 men, occupying a front of 300 or 320 yards, we can start by saying that 200 men in the first line will cover the battalion front; 200 men will support them at a distance of 150 or 200 yards; and the rest of the battalion will act as a reserve, about 250 or 300 yards in rear.

Now, what are the essentials of a good fighting formation?

It must have a large front of fire. Its leaders must be skilled in tactics, in observing, and making the most of the features of the ground, both in order to shelter the men, and also to bring a concentration of fire upon certain points of the enemy's position, and above all, it must be under control: that is, it must admit of being directed from the rear by the Lieutenant-colonel and the Captains, and the discipline must be good enough to ensure orders coming from the rear being obeyed by the leaders in the first line, or as Colonel Home in his *précis* of tactics expresses it—

The formation most suitable for the attack is one which will give Commanding Officers means of feeding the front.

The area of action of a Commanding Officer will be as long and far deeper than it formerly was.

Such a power of direction can only be achieved by organization, discipline, and practice; and although I do not believe that so great perfection is possible of attainment under fire, yet I am satisfied that the more we strive after this ideal, the more perfect will be our form of attack.

The power of direction resolves itself therefore into—

Organization, or the division of the troops into units of a convenient size.

Discipline, or the obedience and deference which troops pay to the orders of their superiors.

Practice in peace of war-tactics.

Commencing then, over how many units can an Officer exercise an efficient control?

A corps commander controls	..	..	3 divisions.
A divisional „	„	..	2 brigades.
A brigadier „	„	..	3 or 4 battalions.

And upon these premisses we may suppose that a battalion-commander could control 4 units, and if he have the assistance of 2 majors, 8 units.

Having fixed this point that the Colonel can command either 4 or 8 units, what considerations govern the size of unit, which for simplicity we will call a company?

The Captain's means of control being limited by the voice, whistle, or signal, if the company has to find its own skirmishers, supports, and reserve, it follows that it must be of such strength, that its front in



line shall not exceed 70 or 80 yards, and when in attack-formation, the line of skirmishers covering the front of the company, will be within the effective control of the leader of 1st line.

Upon this reasoning the strength of the company would not exceed 200 or 250 men if an efficient control of them is to be ensured. And as I may assume that no one will wish to multiply links in a chain of command without reason, we may say that 200 or 250 men being the maximum, 100 men as in our service will be the minimum strength, and the question for decision is, which is the better sized company for the purpose for which it is required?

It so happens that while the Continental nations have the larger company, we have the small one, and we have therefore only to compare the relative advantages and disadvantages of each.

b. For the larger company, the materials that are available for evidence relate to the war of 1870-71. The details of the present campaign are not yet to hand, if indeed they ever are published, which is by no means certain, considering Russian secrecy on the one hand, and on the other that the Turks have probably made no reports and kept no journals. But in relying mainly on the war of 1870, we find not only accounts from both sides in great detail, but that these very accounts have generated a considerable amount of criticism by able Officers to which we may well refer for accurate and well considered professional deductions from the events of that campaign.

Captain May in his "Tactical Retrospect," and Major von Boguslawski in his "Tactical Deductions," have viewed the results of the campaign of 1866 and 1870 with great care, and the reception their books have met with throughout Europe is the best testimony to their value.

Thus Boguslawski says, page 85, of the 1870 war:—"From the first action of the campaign at Weissenburg, until the end, the fights for localities were more frequent and more desperate than in 1866."

"These fights for localities happened necessarily often because skirmishing tactics attained a greater development in this war than they had ever done before, which tactics entail the necessity of taking every advantage of the ground, great and small." And in summing up the characteristic points of the Infantry Battle Tactics of 1870 and 1871, he says:—

"We did see great deployments of skirmishers on both sides, long continued gradually advancing musketry fights, often rolling backwards and forwards; at last the flank of one party turned on one side exhausted, the other side pressing on in consequence, or a rush of dense clouds of skirmishers who endeavour at any price to dislodge their opponnets, not forgetting that in case of failure or retreat they are dead men.

"On both sides great dispersion and intermingling of troops, particularly in broken ground, hence the leaders' control diminished."

"Great clouds of skirmishers and small tactical units, that is the form for infantry. 1859 and 1866 showed the truth of this axiom as applied to actual operations on a large scale, 1870 has confirmed it, nay, it has proved that the action of breech-loader against breech-loader has increased the employment of skirmishers in action."

"All idea of attacking with large compact masses, or of drawing them up in line to fire on one another is finally exploded."

See also, a long extract, pages 161 and 162, ending, "The only way to create this battle discipline is to take great pains with the individual instruction of the soldier and to practise extended order, fighting in a larger and more varied manner."

"We have, since 1854, divided our skirmishers into groups because we wish—

"(1) To control the fire by Officers and non-commissioned officers.

"(2) To prevent the men from different corps from getting intermingled.

"Let us therefore practise skirmishing in masses composed of a perfect medley of men as much and as often as we practise Light Infantry drill with our regular sub-divisions."

At page 167 and the whole chapter, again at page 169, Boguslawski says: "How can we hope to manœuvre satisfactorily with a mixed body of skirmishers, if this state of things is quite a novelty to the men? Therefore, we repeat, we must have practice in disorder."

And one last extract, the last but one of the book: "For soldiers to be able to make a rapid change of formation, to extend quickly, to rally speedily, to be able to fight under all circumstances, whether under their own officers in the usual tactical connection, or mixed up with men of other corps, under strange officers,—these are the cardinal points of our tactics and training. We can only attain this standpoint if we speak out quite clearly in our instructions and regulations upon the nature of the warfare of the present day, and if we banish from our field exercises and manœuvres whatever is not in keeping with it." Boguslawski says in effect—

"By discipline ensure your power of control, and by instruction in peace time teach the men to extract order even from the disorder which is inseparable from the necessities of the case."

c. Let us turn to the German Drill Book of 1876 and see how far von Boguslawski's<sup>1</sup> principles are attended to.

The establishment of the German battalion on war strength is 1,000 men in four companies standing in parade order in three ranks—the rearmost being formed of skirmishers. When formed for drill or manœuvre the skirmishing rank forms up as a skirmishing division.

*The battalion in action with especial regard to the extended formation, and the use of the company column.*

The skirmisher is in most cases left to himself; previous instructions for fighting in closed formations do not apply to him. He must have decision—bodily and mental advantages—with skill in use of the rifle.

These qualities are not found in every man. It is the duty and special aim of the foregoing instructions so to train skirmishers that they not only know their rifles and are active, but have also power of discernment and self-reliance, without which they cannot play their proper part on service.

They must be taught to move freely and actively: and there must be no question of dressing—post—carriage of arms with them.

<sup>1</sup> "Exerzir Reglement für die Infanterie." Chap. xvii. Edition 1876.

They must be taught how to obtain cover from small or single objects—to observe the ground for this purpose.

But the attainment of covert must not interfere with their special objective, viz., the annihilation of the enemy.

The skirmisher must be careful to conform to the movements of the line. Must know himself to be better than one cavalry man—need not fear several.

In enclosed country dressing is out of the question—but lateral communication must be preserved—One section extended, the other as a fire group for the better control of the skirmishers.

In wheeling the dressing is by outer flank, the cohesion and distance to the inner flank.

*Reinforcing, Prolonging, Reducing, and Relieving a line of Skirmishers.*

A line attacked on the march will only require reinforcing when it meets such resistance as compels it to halt. As a rule the support will *prolong* the line :—

In reducing a line, the party called in must be named, withdrawn at the quick time, the others extending so as to occupy the space vacated.

For the sake of unity of command it is ordered that in reinforcing or withdrawing part of a skirmishing line the original division and sections shall not be separated if it can be avoided, and in any case not mixed together.

In rear of every line, a formed body must be placed as support. The company is the support for the division. Further reinforcements may be necessary, but one section must be left unextended.

Dressing is not worth sacrificing the smallest advantage of ground for.

In open ground and a line of several divisions, one is ordered to direct; in enclosed ground, each Officer must keep his men in hand and pretty well closed, lead it according to circumstances, and without giving up cohesion, keep the objective in view.

In all movements the skirmisher must never forget his attention to his Officer or under-officer.

A small whistle is allowed.

Directly reinforcing a line with fresh troops or files is inadvisable, as men of different bodies get mixed and the command is made more difficult; in any case the skirmishers must close in to allow of the reinforcement coming up on the flank or centre *undivided*.

It is impossible to give any rule for posting skirmishers and manœuvring them, and it would only lead to crippling the intellect of the leader, to whom alone it must be left, who in each case must choose such means as will enable him to accomplish his object with the least loss.

Above all, the fundamental rule is that skirmishers are only supported by men of their own company.

This must be the practice at drill to accustom the leaders of troops to act accordingly; especially is it most important in enclosed ground.

I have only taken a few paragraphs, but there are yet about four more which seem to me so good and so telling that I may be excused for troubling you with them.



They relate to skirmishers, leaders, and Commanding Officers.

No more skirmishers are to be extended than are necessary for the strength of the enemy, unless it is wished to obtain a rapid result.

A skirmishing line is well placed when not only each individual reaps the utmost advantage from the features of the ground, but further, when the important points are strongly occupied, and the weak points defended by cross-fire.

In addition to the greater or less importance of the part played by skirmishers in battle, and the difficulties which the direction of large bodies entails, not only is the expected perfection of the individual most important, but it is just as necessary that both Officers and non-commissioned officers should possess a clear idea of the science of fighting, and exhibit valour in the different circumstances that present themselves.

The leaders must endeavour not to let their men get out of hand, and must regulate the fire, judge the distances, and estimate the order and strength of the enemy.

All leaders, from Captains downwards, must observe that after carrying out a duty, their first business is to join the battalion rapidly, and their superiors must look to this for fear of troops getting out of hand.

A battalion is well commanded when the Captains, after a short order, combine to achieve a common end without the loss of the unity of command even for an instant.

Our infantry is able to repel with its direct fire even the most persistent enemy, and that enemy's losses will be so heavy, that the same troop can hardly make a second attack. This conviction should be impressed on the infantry, that it is unapproachable in front, and need only be anxious when it turns its rear.

An infantry which has its flanks protected and does not mind long-range fire, and opposes to the enemy's rushes its cool volleys, is invincible.

Therefore the covering of the flanks is most important, and the greater the distance of the supports, the greater the importance of assured flanks.

At the instruction of infantry, all the drill will be practised on the parade ground exactly as if the troops were before the enemy.

The application of the proper forms of attack and posting of troops must be taught on the actual manœuvre ground.

Upon the parade ground only certain things can be taught:—

*Skill* in executing the forms of attack and evolutions.

*Intelligence* as to the mutual relations between the troops and others, either on the flanks, or in front or rear.

*Exertion.*

*Discipline.*

It is, however, not necessary to practise numerous and complicated formations as valuable manœuvres.

A few simple forms, as given in the preceding pages, suffice for all purposes of field service.

It is, however, absolutely necessary that each battalion should be

able to execute with accuracy and without confusion the simple formation which service requires, on unfavourable ground, in darkness, rear rank in front, and even when unformed.

And upon this, beyond all else, great stress is to be laid—

That the influence of the Officer commanding, on the troops and the attention of the troops to the orders of the Officer commanding, and to the preservation of tactical connection, should not diminish either by the fatigue consequent on great exertion or by the privations of war.

Turning for a few moments before we leave the subject of drill to the French Drill Book,<sup>1</sup> I am glad to say that we find the same general principles re-affirmed and constant. I will quote two or three passages to prove this:—

To ensure cohesion and unity of aim, extended order should only be formed when indispensable, and returned from as soon as circumstances allow it.

The Officer forming the battalion must regulate the action and keep the power of direction.

The course of instruction in peace-time is laid down.

Transmission of intelligence is prescribed.

Whatever manœuvre is being executed, that the men should be everywhere and always well in hand: and therefore no difference must be made in matter of discipline, between formations in extended order and other ones. Each must give to his leader his sustained attention.

French attack formation is in—

Four Echelons.	
Skirmishers	} 2 Companies or
Reinforcements	
Supports	
Reserves ..	$\frac{1}{2}$ Battalion.

Depth from skirmishers to reserves about 600 yards.

The line attack is covered by scouts advancing to about 800 yards from the enemy's line of defence, and then deploys in rear of scouts who open fire within effective range. At 600 yards the line of attack joins the scouting line, and if reinforcements are required, they should be brought up, as organized fractions to avoid mixing sub-units. Supports conform to the movements of their own line, gradually closing up, and when required reinforce it. When supports are all in action, a company of reserves replaces them, and this is the time for final attack with the latter. If possible, save the last company as a closed body, but if not, send to second line for fresh battalion, and on first occasion reform battalion.

I will read as a last extract a paragraph respecting a battalion acting independently, in which the French Drill Book properly states that it is difficult to give fixed instructions, adding "if the officer commanding the battalion has during peace time instructed and exercised his units of combat in such a manner as to prepare them for

<sup>1</sup> "Les manœuvres de l'Infanterie." Edition 1876. Combat du Bataillon encadré. Par. 100 *et seq.*

“all eventualities, if he have himself acquired the skill to command and direct them upon the field of battle, in such a manner that each one of them, while operating under its own initiative in matters of detail and of execution of movement, yet conforms to its general instructions and acts for the common end, he will be able in many cases to apply to the original formation and to its duties in the action, the modifications necessitated by the alteration of circumstances.”

It appears then that the principles of French and German drill are the same, and when I add that the French, who had a six-company formation in 1876, altered it to a four-company one, like the Germans, we may say that those two nations have decided that the system of attack which offers the best chance of success is one in which the fighting unit is about 250 strong, and shall furnish its own skirmishers, supports, and reserves, and, in so doing, its sub-units shall not be mixed up; firing to be only by word of command; and that the system must be practised in peace-time. The same conclusion has been come to pretty generally through Europe. If we consider the above principles, we shall see that they only combine to secure power of direction.

A battalion in the field in attack-formation covers a parallelogram about 320 yards in front, and 500 yards in depth, and men distributed over this space can only be directed by one man, from the rear, on two conditions: he must have a command of depth from rear to front; secondly, there must be a command of front in the first line.

The space in the first line which can be efficiently controlled, may be stated at 80 yards by  $\frac{1}{3}$  or  $\frac{1}{4}$  of a company.

The command of depth can only be obtained by discipline, and no mixing of men.

And if we can find a system by which command of front and of depth by the Commanding Officer is attained, it will be a satisfactory one.

d. Let us now turn to our eight-company organization, and we shall find ourselves in this tactical difficulty, that we cannot get power of direction in depth *and* front; we must sacrifice either the one or the other—because the company of 100 men is too small. If each company furnishes, as on the Continental system, its own three lines, the skirmishing fourth or section will cover the company front, or about 40 yards. The second section will support the first, and the remaining half-company will form the reserve. In this way, the company will fight in column, and will satisfy the requirements of command of front and depth, by captains; but will have this disadvantage, that the first line will consist of eight small co-equal parts, and will lack the power of attack conferred by unity of aim, which even a field Officer in rear of, and commanding the line, could not impart to it. Colonel Home criticises this formation, showing that there will be no cohesion or unity of aim in the line of skirmishers or in that of supports.

He considers the area of command, 40 yards in front, and 200 or 300 in depth, too great for one Captain, and declares himself in favour of larger sub-units, and looks upon the mixing of men as inevitable.

But if too great for the Captain, how shall the Colonel command his battalion? and if too great for Captain or Colonel, what will happen to the battalion?



The powers of command must be acquired somehow.

But what prospect would there be of an attack so formed, preserving its unity of direction.

Formed in the attack order, 1,000, and possibly 2,000 yards off (for we read in the "Militär Wochenblatt," that the Turkish breech-loaders at Loftcha and Plevna caused heavy losses at even 2,000 paces), I ask what chance would there be that eight little sections of 20 or 25 files would advance, for, say, 1,500 yards to the attack of a position, over strange ground, some wooded and some open, without losing their direction, crossing each other's line, masking each other's fire; I say, what chance would there be of an advance so made, being successful, and what Commanding Officer could keep an efficient control over these little parties? I think, therefore, that we may decide that our companies are not strong enough to furnish their own complete attack.

Again, if to increase the unity of aim over the first line, we halve the number of units by doubling their strength and cover the front of two companies with a half company, and support with the other half; when the reserves of a different company come up to reinforce, the men become mixed; they lose the Officers, and the Officers the men; they are no longer under command, the power of control vanishes; and of course all these evils are aggravated by covering a half-battalion with one company extended. On reinforcement by supporting company, there is mixing, and by the reserve, treble mixing.

Therefore, it is difficult to apply sound principles to a small unit.

With regard to our own form of attack, it will not be necessary to say much. It has both advantages and disadvantages.

Two companies cover the battalion front, each under a Captain; and the whole first line under a Major, and an attack made with such a disposition ought, at all events, to have unity of aim.

Also, as No. 2 supports No. 1, and No. 4 No. 3, it is probable that the men will know each other more or less, and therefore facility of command will be increased.

As against the formation it may be said:—

- (1) That 150 yards is too long a line for effective control under fire, and the line of attack will get out of hand.
- (2) That the extension of the whole company, necessitates the support belonging to another company, which, though it be No. 2, is yet an evil, and causes difficulty of command.
- (3) That the difficulty is increased *à fortiori* when the reserves come into line.
- (4) That if the reserves do come into line, you have the companies hopelessly mixed, for on the one half-battalion front you have Nos. 1, 2, 5, and 6, and on the left you find 3, 4, 7, and 8.

The intention of this form of attack has clearly been to keep a complete half-battalion for the reserve; and this will be right or wrong, according to the use to which the reserve is put.

But the first point is to fix our unit.

Gentlemen, what is our unit now? Is it the battalion, half-battalion, or the company?

1. If it be the battalion, then we have a clear right to demand a smaller one, on the ground that one man can do now what four could do with muzzle-loaders; and it is, therefore, a waste of power to keep our battalion unit, and looking to the difference of tactics and arms, it is hardly likely that the organization of 1778 can suit 1878.

2. I do not think the half-battalion is our unit. It never has been either an administrative or a tactical one. The Major has no powers of punishment, and it has not been used in the field independently—as a rule.

3. Is the company our unit? It is and it is not. In the sense of being complete under one leader, it may be called an administrative unit, and it is detached at home and on service; but, in a tactical sense, it is not complete, *i.e.*, it is not independent of the battalion. It cannot be detached, for say 3 days; and I say, therefore, that the company is not our unit. If a German company is detached, it is complete in its organization, Officers, non-commissioned officers, and men, with its own company waggons, which hold the baggage of Officers, a reserve of boots, coats, other equipment, and 2,880 rounds of ammunition, *i.e.*, 17 rounds per man.

If we have a unit at all, it is the one that we have had for the last 100 years, from the days of Brown Bess.

That unit is the battalion, which was, and is, the administrative unit, which was the tactical unit, and is allowed to remain so, under a different armament, because it lends itself, with tolerable facility, to sub-division into smaller sub-units, which we call companies.

But, gentlemen, the smaller sub-units will not and cannot play the part of an organized tactical unit. It is not sufficient to say, if one company is too weak, send two; if two are too weak, send half a battalion. For fighting the breech-loader, you must have unity, moral as well as physical, at home as well as abroad.

Two horses will not necessarily make a pair, or eleven cricketers a cricket eleven; and for such unity as is now required, the men, non-commissioned officers, and Officers must know each other, must look, if possible, to only one leader, for their pleasures, their toil, and their subsistence, and live and work together in their separate relations during peace, if they are to have their full fighting value in war-time.

Such a unit is what a small army like ours most requires, one that shall put the men into action on the best terms, and compensate for numerical deficiency by superior excellence; and if we are agreed upon the following three propositions, *viz.*, that

breechloading arms have caused independent fighting;

difficulty of control is thereby increased;

difficulty is at a minimum when the command of depth and the command of front is assured;

we must inevitably come to the conclusion that this power of direction can only be obtained in one way, *viz.*, by having the largest unit that can be commanded effectively in extended order, and that is a unit of 200 or 250 men.

The Austrians have, in their re-organization, made such a point of obtaining control, by giving to each sub-unit its own leader, that

their company can be broken up into 4 sections, and each section into 4 small groups of 15 to 20 men, and yet supply each with a leader and a guide for front and rear ranks.

Thus, their company consists of—

1 Captain, 3 Lieutenants, 1 Cadet ;

1 Sergeant-Major, 4 Section Sergeants, 12 Corporals, and 18 Lance-Corporals ;

And can be sub-divided into 16 independent parts.

Similarly in the Italian Service.

We are told that in Germany the division of the battalion into four companies resulted from its being an economical organization. If it be so, it is not necessarily a reason for looking with disfavour upon it.

That in Austria and Italy the same system has been adopted because in those countries Officers were difficult to get ; while by universal service, good non-commissioned officers were plentiful.

But I cannot believe that all these great military nations in Europe have adopted (including France) an unsound organization for such reasons.

We have plenty of Officers and plenty of money. Our case is very simple.

Having a battalion unit in the service, we arm it with a weapon which multiplies its power and efficiency by 4. The weapon in the enemy's hands increases the difficulty of command in the same ratio ; and we reject the solution—

That the division of the unit into four companies will afford the best chance of meeting the difficulties into which the introduction of the breech-loader has brought us.

This I call a tactical deduction.

I venture to submit, however, for consideration whether there are not, in our present attack-formation, blots of principle as well as of detail.

Those of detail can be remedied at any time : but the blot of principle is, as I think, more dangerous.

It lies in the part which covertly as well as openly we assign to our reserves of battalion.

There is an underlying feeling that the reserves of a battalion of the first line are to be used for the *final* rush, which finds expression in Colonel Home's "Précis of Modern Tactics," in which it is stated : "The duty of the main body is to advance the moment the enemy is sufficiently shaken, and drive him out of his position ;" and even in our Field Exercise, page 211 :

"The duty of the battalion main body is, in conjunction with the companies extended in its front, to *finally* force the enemy's position." And again, page 223 : "The order to reinforce with the main body will be given by the Commanding Officer alone, and would probably *only* be necessary when the fighting line cannot push within 100 or 150 yards of the enemy."

Such an instruction, especially when a system of attack is based upon or even affected by it, I think contains the elements of danger, because it may and probably will indispose Commanding Officers



to extend the battalion main body for fear that if once thrown into the fighting line it will not be available to drive the enemy out of his position; and the result of such tactics will be long, halting, indecisive actions, which will give the enemy time to bring up troops to the threatened part of his position, and make his ejection an impossibility.

e. What are the lessons of 1870 and 1877? Why, that direct attacks hardly ever succeed, except at a most tremendous sacrifice. And in my opinion the suggestion that the four companies of a battalion are likely to "shake an enemy," may be a good one to instil into the troops of the first line, but it is not a proper axiom in military instruction.

Consider the circumstances under which attacks are made; how they vary. At Weissenburg five battalions attacked two French battalions on the Geisberg. The attack was made by half the force on half the front, the other half being in reserve, and the attack failed though they had four men per yard on the ground.

At Columbey, to the east of Metz, the advance brigade of the 7th Prussian Corps attacked the enemy's 3rd Corps, in order to delay its retreat over the Moselle. Before General Goltz, commanding the brigade, was supported, he had committed to the action 27 companies out of the 28 belonging to him. Subsequently he was reinforced, the French retired, and it was discovered that his attack had arrested two corps of the enemy on the right bank of the river.

Similarly, to the west of Metz, all chance of throwing back the Imperial Army into Metz depended on their being cut from the line of retreat to Verdun.

The 3rd and 10th Corps crossed the Moselle, and by means of forced marches, struck the high road at Mars-la-Tour, occupied it, and regardless of numbers attacked the whole French Army, which was then out-flanking the German left. As everything depended upon maintaining their position, the 38th Brigade under von Wedell was ordered to attack some heights in its front, and the 16th and 57th Regiments formed for the attack, and on arrival found Grenier's division formed up to receive them with Cissey's coming up to reinforce, and the brigade could only re-form its ranks seven or eight miles in rear at Thionville.

Or again, if turning to the war of 1877, what was the loss of life at Plevna, when Skobelev attacked the Green Hills to the south-west of Plevna and lost 8,000 men (it was said) out of 12,000, and stood in the centre of the attack piling one battalion on top of another! Gentlemen, I say we do not realize what these attacks cost, nor the endless variety of circumstances under which they may be made.

We are all ready to subscribe to the tactical formula that we must have five men per yard to attack a position; and then we talk of *shaking* the enemy with an expenditure of one or two men per yard. The attack is more serious than this, and in 99 cases out of 100 the reserves of the battalion of the 1st line, as well as those of the 2nd line will be pretty well expended before the enemy is shaken, and the time has come for the final rush.

As I read the military history of the last campaigns, the part that reserves have to play, is quite different. It is that of carrying forward the wave of attack, and not of making a final rush in line, though the latter was the duty of reserves when attacking muzzle-loaders.

Unless the defence is very weak, I do not think it probable and hardly possible that one battalion should be able to attain the enemy's position, and if I am correct, we should frame our attack formation to meet the difficulties of battalions expended in the fight and not those of battalions who can keep their one half in the ranks.

It is doubtless most distinctly the duty of Officers commanding battalions to husband their reserves, and to send them into action as sparingly as possible; and they must command a view of the attack, and feel the pulse of its strength or weakness so as to know when to send in their reserves, but they must realise that their highest duty is to forward the wave of advance, and possibly to exhaust their battalion in so doing. I believe that this is an accepted idea.

The real obstacle to the adoption of a good formation is that Commanding Officers cannot bear to realise that in the service of war their commands may melt away out of their power.

The battalion, and brigade, and Commanding Officers cannot bear the idea of being left without a reserve to forward an advance, or make safe the retreat, and therefore they will not initiate what I must call, for want of a better term, a single-minded formation of attack. But I can only say, that in my opinion this is the one lesson, the one fact which is proved to be the direct and inevitable consequence of the introduction of the breech-loader—that the fighting attack must be made *solely* with a view of attaining the enemy's position; that such troops as take part in it must be left out of the calculation of the available force for the rest of that day; and that the same thing will happen to us that has happened to Continental nations in these three last campaigns, viz., that Commanding Officers of battalions and regiments have been compelled to attach themselves to companies in the first line, because their commands had melted away from them in the exigencies of the fight, and they could not remain without joining something.

Gentlemen, I hope I am wrong, but I much fear that if we have not now profited by the experience of the late wars, we shall not do so until we have had our lesson.

The Austrians learnt theirs at Königgratz;

The Germans at Spicheren, Gravelotte, the combat of Flavigny;

The French at Sedan, and in the sorties from Paris; and

The Russians at Plevna and Batoum.

And all have realised that the part played by the old skirmishing line and the rest of the battalion, is now played by the battalion forming the attack and the rest of the brigade; and appreciating at once the difficulty of retaining command of the troops so spent, have reorganized their several armies to meet this result.

f. The remedy can only be ascertained by a consideration of the principles that influence and affect a fighting formation.

The problem is to attack or defend a certain front. Under old con-

ditions, say those of muzzle-loaders, it was found that a two-deep formation, preceded or not by skirmishing line, gave sufficient power to accomplish the required end.

Another arm is introduced, which fires four times as fast, four times as far, and thereby increases the efficiency of the individual enormously, and makes closed formations impossible within range.

The only solution is to be found by enlarging the principles of drill.

The difficulty of attacking depends on the relation between the front of attack and the effective range of the rifle. When each was 250 yards, a line of infantry sufficed. Now that the range is three times the front, you must reduce your fighting units and prolong your line of attack, and this is no doubt the origin of the system of out-flanking tactics now in fashion.

I take a company 200 strong to be the best sized fighting unit; small enough to be able to take advantage of cover, with as large a front as can be effectively commanded under fire, and strong enough to make a good attack or defence.

The German company is one-fourth stronger, and is formed into three divisions, of which one is composed of skirmishers.

These men are specially selected for this duty, accustomed to work together, active and skilled in the use of the rifle.

But in view of the great development of skirmishing, it seems to me better that every man should be practised in it.

Another distinctive characteristic of the German army is the perseverance with which they study the art of fighting. Any one who wishes to know how an infantry Captain instructs his men, can read Hauptman von Arnim's Journal, translated by Major East.<sup>1</sup>

The advantage of learning the moves of a game before you play, needs no exposition; but I am satisfied that, improve our men as we may, and study the game as we will, we shall fight under more favourable circumstances against modern firearms, when we have a fighting unit that can find its own skirmishers, supports, reserves, and leaders who can be trusted to work with unity of aim.

And when we have attained so much of improvement as relates to the supply of ammunition, a perfect unit, and good leaders, there will be one more step to be taken before the machine is perfect, and that is, the cultivation of the intelligence of the rank and file of the Army.

We teach men to drill, to shoot, gymnastics, and, in short, cultivate them physically in every way; let us also cultivate them mentally, and make them practise in peace, that which they must perform in war-time.

Teach the soldier to think; teach him to obey an order in the spirit as well as in the letter, and in all that concerns the soldier only, such as dressing, covering, &c., and the more important duties on service, let him feel that it is his business to act as his commanding officer would wish him to act.

And when we have taught men to know the part that each plays in the great drama of war, and to feel the immense importance that each

<sup>1</sup> See Journal of the Institution, Vol. xxi, No. 89, page 275 *et seq.*



is, as one of the factors without which the game cannot be well played, and the paramount necessity, not only of his keeping his own place in the scheme of organization, but of helping others to keep theirs; they will come to feel also that when the attack is shaken, or possibly repelled, and their company disorganized, that they can still play a great part, *if* the element of re-forming lies within themselves, and if they contribute their co-operation no less than their obedience to the orders of their leader; and if their thoughts as well as their actions are at the service of their superiors; we shall then have done more to ensure the success of our arms than by any other improvement whatever.

As Colonel Home observes, there is nothing that tends to raise the moral power of an army more than education; the consciousness of possessing superior knowledge adds greatly to the power of an army.

And, as Captain May says in the "Tactical Retrospect," an army that cannot venture to trust in the individual value of its soldiers so far as to let them fight in irregular formations, cannot reckon on the advantages to be derived from the operation of the breech-loader.

And with such a change in the British Army, a great deal of our stiffness and slowness of drill will disappear, as it must do before the breech-loader, as unnecessary. Boguslawski says in his last book—

"The education of a nation in general and its military education in particular, are the sources of the tactical efficiency of its army."

"A good and simple formation is indispensable, but even this is of no use whatever without education."

Does any one suppose that such manœuvres can take place under fire as a deployment into line, an advance in line, a wheel in column, or that mounted points, and battalion and company markers, will be able to carry out their duties? Or does any one suppose that a battalion of the first line, will take its colours with it into action? And if they do, does any one think the colours will return to camp?

If the colours are left in rear, they become an element of weakness inasmuch as they deprive the battalion of so much breech-loading fire as is reserved for their escort. If they are with the battalion, what is their place? An advance in line with the colours in centre will not get within 200 yards of the enemy in my opinion.

A battalion, if it have to deploy, must learn to do so rapidly and silently without points, and properly instructed, the companies in succession will come into the alignment and lie down, the flank men putting up their forearms or their rifles for the next company to dress by; and when they find that this is expected, the men will rise to their higher duties, and the formations will be just as good.

I do not undervalue drill as drill, but I value it more for its moral than its physical effect.

Drill teaches obedience, smartness, good behaviour, self-respect and discipline, and is the most important element in a soldier's education. It makes a man a better soldier while serving, and a better citizen afterwards, and therefore is worthy of all praise; and when we realise what qualities are required from soldiers in a campaign, our drill or peace education will be made to lead up to their acquisition, but we

must not confound peace-time with war-time, nor go into the field prepared only with barrack-yard manœuvres, or we shall receive such a lesson as we shall not lightly forget, for I am certain of this, if of anything, that the days of deployments, and advances in line before an enemy, are as completely gone as are the days of Frederick the Great, when they were in their greatest perfection.

Gentlemen, one word more. It used to be said at the close of the Great War, that one Englishman was as good as three foreigners, and there is no reason to suppose that they are any better, or we any worse than in those days, and in a twelve-foot ring, or in a street row, or with Brown Bess for our arm, it would probably still be true.

But we must recollect that every improvement in the art of war, whether of armament or of organization, tends to diminish our advantages, and with 300 yards between them, and an equally good rifle in the hands of each, one man is as good as another, that in short under the fire of the breech-loader, morale is in danger of losing its power because it cannot arrive *aux prises* with its adversary.

And if this be true, let us be careful, lest in presuming too much upon the advantages that we have had in years long past, we refuse to entertain the idea of modifying our institutions when they require it, or delay the necessary changes until it is too late, and possibly dangerous to make them. The secret of security is preparedness; we have inherited a vast Empire, but with it the responsibility of its preservation in its entirety; and as a French historian, M. Martin, says, “Une nation qui veut maintenir sa position devant le monde doit être prêt à faire face partout.”

The discussion was adjourned to Friday, May 10th.

Friday, May 10th, 1878.

LIEUT.-GENERAL SIR GARNET J. WOLSELEY, K.C.B., G.C.M.G.,  
&c., &c., in the Chair.

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## ON THE INFLUENCE OF BREECH-LOADING ARMS ON TACTICS, AND ON THE SUPPLY OF AMMUNITION IN THE FIELD. PART II.

By Colonel EDWARD CLIVE, Grenadier Guards.

IN the last lecture I endeavoured to lay before you some of the difficulties into which the breech-loader has brought us; such as the supply of ammunition and the altered character of the fighting which formerly was in closed order and collective, and now must be in open order and individual, and I made quotations from the works of von Boguslawski, von Scherff, and Captain May, to show that this had resulted from the introduction of the breech-loader.

I propose to-day to consider:—

- (1.) The question of supplying ammunition, &c.;
- (2.) The qualities in our troops that will be most in demand in the actions of the future.

Taking first the ammunition question, I have by the kindness of friends been able to obtain particulars of the different systems of some Continental armies, viz.: France, Germany, Austria, and Turkey, which I will lay before you, and although our troops have never met breech-loaders, I will explain our own system both as it now is, and as it has been in our two last small wars, in Ashantee and in the expedition of last February against the Jowakis.

Commencing then the question of supplying ammunition, we must consider:—

- (1.) The expenditure in action, ordinary and extraordinary.
- (2.) The system of distributing it from the waggons, carts, or pack animals, to the troops in action.

### *Expenditure of Ammunition in Action.*

The average number of cartridges fired in action is usually not large; though some regiments or parts of regiments may occasionally fire away a great many.

Thus in the 1st Prussian Army, which attacked the west front of the Austrian position on the Bistritz River at 8.30 A.M., in July, 1866, and remained heavily engaged all day, the average expenditure was only 12 rounds per man, though in one regiment it rose to 72 rounds, and in the case of two companies to 80 rounds.



Again, in 1870, the second division of French Imperial Guards at Rezonville fired an average of 20 rounds.

The French Army of Metz expended only 25 rounds per man, and in the same campaign the 12th German Army Corps expended in the various battles from 6 to 15 rounds per man only.

And even these figures are in excess of the real ones, for in them is included the ammunition that is lost (though not fired) belonging to the killed and wounded, and dropped by the living.

I may add here the experience of a field day that took place before the Emperor of Germany two or three years back, to test the rapid firing of the infantry rifle.

The troops that took part in it were 6 battalions infantry, 5 squadrons cavalry, and 1 battery artillery.

Five of the infantry battalions were supplied with 40 rounds per man, and the other battalion with 60 rounds per man, and orders were given to keep up the heaviest possible fire; and as it was an experiment with all arms, there is no reason to suppose that the movements did not represent an ordinary service action, yet no man fired more than 45 rounds. Of course the excitement of battle was not present, but I should think the result arrived at was a true one.

It must, however, be borne in mind that in providing ammunition for troops, the estimate must not be the ordinary but the extraordinary expenditure in one day; and also for the possibility that troops might be engaged for several consecutive days without having an opportunity of completing their supply of ammunition.

The amount carried by the British soldier is 70 rounds: viz., 20 in each pouch, 20 in valise, and 10 in the ball bag; which, however, will carry 30 more rounds if necessary. The regimental transport is charged in addition with 30 rounds per man in ammunition carts called the Regimental Reserve of Ammunition. Another 40 or 30 is carried in Division Field Reserve, and the same number in Corps Field Reserve; and at the dépôt there are also from 300 to 800 rounds per man.

Turning now to the amount of ammunition carried by the principal European nations, I have embodied the information which has been supplied to me in a table for greater facility of comparison.

Ammunition.	British.	French.	German.	Austrian.	Russian.	Turks.
In possession of Troops..	70	74	80	84	60	70 to 150 20
Regimental Reserve ....	30	18	37	35	40	
Divisional Reserve .....	40	..	..	30	40	
Army Corps Reserve ....	40	46				
Ammunition Column....	..	..	73			
Grand Park Dépôt.....	..	32				
Base Dépôt .....	180	170	190	149	140	
	300	115				
	480	285				

		Lbs. oz.
Weight of 100 rounds	Martini-Henry.....	10 8
"	" French.....	9 10
"	" German.....	
"	" Austrian.....	
"	" Russian.....	8 3
"	" Turkish.....	10 5

### *The English System.*

The materials available for our enquiries consist of the *Soldiers' Pocket Book*, an able report on the subject by Captain J. T. Barrington, R.A., treating not only of small arms, but also of gun ammunition, and of the systems practised in the Ashantee campaign, and in this last expedition against the Jowakis, the particulars of which have been kindly furnished to me by Officers who took part in those wars.

In our service each battalion is provided, as laid down in the *Equipment Regulations* of this year, with three ammunition two-horse carts, the carts containing sixteen boxes of Martini-Henry ammunition, each box holding 600 rounds, or 9,600 rounds. Total per battalion three carts = 28,800 rounds, or 30 rounds per man for 960 men.

The cart empty weighs .....	8 cwt., 2 qrs., 0 lbs.
Sixteen boxes " .....	1 " 3 " 20 "
9,600 rounds " .....	9 " 2 " 8 "
Total weight.....	20 " 0 " 0 "

The box produced is a service ammunition box, made of mahogany, with a sliding wedge-shaped lid, which is screwed down, so it is difficult to get at the ammunition. For the distribution twenty-two canvas bags are provided, viz. :

Two per cart for three carts.

Two per company for eight companies.

The carts have a leather pocket outside in which the necessary tools are carried, and the bags can be placed in a shallow well under the cart.

If pack animals are used instead of carts, twenty-four or twenty-five animals will be required for the service of reserve ammunition per battalion, inasmuch as one animal can only carry two boxes, which, with pack saddle and cover straps, &c., would weigh 206 lbs., or nearly 15 stone, exclusive of forage, picketing gear, blankets, and grooming necessities.

In the Ashantee campaign, where wheeled transport was out of the question, each infantry soldier carried his 70 rounds. The regimental reserve of 30 rounds was carried by coolies, each man carrying one box on his head, the bearers being under a non-commissioned officer.

The first reserve of 40 or 30 rounds per man, carried by similar means, had its place in the column of route under an Artillery non-commissioned officer, as also the second reserve of the same amount.

In bush fighting the expenditure of ammunition is often very great, and in the advance, instances occurred in which individuals fired more

than 100, and even 120 cartridges away probably with little result; and, of course, the difficulties of distribution and completion of supply were increased. As the boxes take some time to open, it was found advisable to have those in the first reserve unscrewed, and in that state delivered to the bearers of the regimental reserve, who returned for more ammunition.

The expedition under General Ross against the Jowakis consisted of One battery.

Four guns, R.H.A.

One regiment, cavalry.

1,200 British infantry.

1,600 native infantry and some sappers.

The fighting in the Bori Valley was done by 1,000 native troops with 600 British troops in support, covered by the Royal Horse Artillery guns, Ammunition taken was 200 rounds per man, of which 40 rounds were carried personally and the rest upon camels as far as Fort Mackeson, each camel carrying six boxes = 3,600 rounds. At Fort Mackeson the camels were replaced by mules, carrying two boxes each, who remained with the reserve.

When advancing in attack formation the mules remained on the top of the hill, and twelve men of each company followed in rear of skirmishers, carrying, besides their own 40 rounds, leathern boxes called "cartouches," each containing 200 rounds. The men disliked this work extremely, and it was found necessary to relieve them after two miles of heavy and broken country. There was little firing, and the system was not well tested.

Any troops in action can draw on a reserve waggon of first reserve for ammunition. It is not essential to give a signed requisition, but a slip of paper can generally be written and signed while the ammunition is being given out, which acts as a double check afterwards both on the amount of ammunition remaining in the reserve, and upon the corps who may have fired too much away.

#### *The French System.*

In France ammunition is divided into two categories.

That which is carried either by the men or in the battalion caissons, for which Officers commanding corps are responsible; and that carried and horsed by divisional artillery, for which the O.C.R.A. is responsible.

Battalion reserve is carried in four-horse waggons, one per battalion, regimentally driven.

Cartridges are carried in the ammunition boxes enclosed in canvas bundles fitted with a handle (each bundle holds 28 packets of cartridges = 168 rounds); one box holds 38 bundles or 6,048 cartridges, with 12 canvas bags for conveyance and distribution to the troops.

Each waggon has three boxes, or 18,144 cartridges. Requisitions on the regimental reserve are made by Captains, on the divisional reserve by the Officers commanding regiments.

The system of carriage and distribution is under consideration.

At present the troops in action send for it. The men sent fetch a bag with 60 packets, and distribute it; weight of 60 packets, or 360



rounds, about 35 lbs. But experiments are to be made on this subject at the forthcoming manœuvres.

### *German System.*

In Germany the regimental reserve is carried by regimental transport, 23 rounds per man, in special battalion six-horse waggons; and 14 rounds per man in the company pack carts.

The Jäger battalions have no battalion waggon, but an extra cart per company, making eight in all for the battalion.

Each waggon is provided with twelve canvas ammunition bags, each holding about 500 rounds.

Two or three men per company are told off for this duty.

Troop leaders can draw on the waggon under their orders for ammunition.

The Austro-Hungarian system for the supply of ammunition was reviewed in the *Revue Militaire* for 3rd November, 1877, No. 375, and two points come out strongly.

(1.) The issue of 12 supplementary rounds to troops ordered into action, making the personal supply 84 rounds.

(2.) The immediate and successive completion of the supply of ammunition at each halt, and even the completion of that of the supports when they go into action.

If the reserve ammunition waggons are not up, the drummers, buglers, and pioneers proceed to the waggons, fill up the bags with which the waggons are equipped, and which carry 500 rounds, and carry them to the companies, returning with the bags empty and repeating the process.

If the ammunition is to be delivered during the combat, the groups of reinforcement undertake the distribution to the men in the first line.

Lastly, any corps may demand ammunition from a reserve waggon even when belonging to another corps, and it is complied with.

No requisition or receipt is required, but an account is kept by the non-commissioned officer in charge of waggon, so that he may know the amount of ammunition yet remaining in charge.

### *Turkish System.*

From a report made upon the Turkish supply of ammunition it appears that they used for its transport arabas, or two-wheeled carts, which accompanied the regiments on the march when they could do so.

For a difficult country, which was the ordinary state of things, or when going into action, pack animals were found indispensable.

Each battalion had from 24 to 30 of these, each carrying 2 zinc-lined boxes as they came from America, containing about 1,000 rounds each. The animals were led by men of the battalion, and on the cessation (even temporary) of the action the pack animals could be easily seen going down the line of skirmishers or entrenchments distributing ammunition.

The Russian cartridge weighs  $\frac{4}{5}$ ths of the Turkish cartridge, and consequently they can carry a quarter more for the same weight, which is an advantage for transport when it is recollected that some Turkish battalions fired 150 rounds, or 16 lbs. weight, in one day.

This is probably the highest expenditure ever known; and it appears from the reports in the *Revue Militaire* and the *Militair-Wochenblatt*, that baskets for cartridges were found inside the Turkish entrenchments, and the defenders were thus able to keep up this *feu d'enfer*.

The Turks have no valises or bags to distribute ammunition.

The Turks carried little but food and ammunition; and in that manner managed to carry as much as 120 rounds, or nearly 13 lbs. weight of ammunition, which rendered them independent for several days.

### *Russian System.*

The Russians in entering on the campaign conveyed their reserve ammunition on two-wheeled carts; they subsequently found it absolutely necessary to have recourse to pack animals. There are no bags for distribution. They have, however, the advantage with the new rifle of carrying only one nature of ammunition both for cavalry and infantry.

It appears then, so far as the quantity of ammunition is concerned, that all European armies either carry or have at hand a supply probably greatly in excess of their probable or even possible wants. The only question is whether our system of distribution is as good as that of supply. There are few subjects that will so well repay practice as the distribution of blank ammunition to troops in action; partly because the difficulties can be improvised as well for blank as for ball cartridge; and partly because there is nothing so fatal to the soldier in action as not having a sufficiency of ammunition.

I should like to see experiments tried for the elaboration of the best system. Serve troops out with 15 rounds, and make them fire 60. When the communication is perfect between the fighting line and the cart close to the main body, place it one mile to the rear, and try the system of communicating and the fire discipline of the men. Only take advantage of peace to anticipate and provide for the accidents of war.

In regard to the mode of conveying the ammunition, whether on wheels or on pack animals, it seems to be a question decided by common sense and the nature of the roads.

If the roads are good enough wheeled transport is a saving of horses, their attendants, their food, &c., inasmuch as a two-horse cart carries at least as much as eight pack animals.

If roads are bad, and carts cannot travel, as in the Jowaki expedition or among the Balkans, pack animals must be had recourse to. It would be therefore an advantage in equipping an expedition for service to supply some pack-saddles and horses with fittings, which could be used if necessary; and I understand that this will be done in our Service.

I am unwilling to close this subject without referring to the question of long-range fire which is exciting a considerable amount of attention on the Continent, and which has stout advocates and opponents.

The question for decision is, shall infantry fire up to the full range of the rifle, or reserve its fire?

The disputants on either side may be fairly personated by Major von Boguslawski and Captain Horsetzki. The former, who thinks long-range fire is full of danger, and should be absolutely forbidden, states:

(1.) That efficacy of fire is very questionable, because target practice is no real guide, and trying different ranges wastes the power of the rifle.

(2.) Heavy columns are less and less used on battle-fields.

(3.) It wastes the ammunition, and

(4.) It is opposed to the offensive spirit; and in a review in the *Réunion des Officiers* on the 1870 campaign, we read that at the Battle of Wörth "the long-range French fire had but a mediocre effect." And again, at Spicheren, "The fire of the division Lavean-confet at long ranges produces no appreciable effect."

On the other hand, Horsetzki is a strong advocate for it, asserting that the supply of ammunition is a matter of detail and organization, which must conform to the requirements of tactics.

The shooting is better at long ranges than short ones, but allowing that the fire must be at a fitting object, such as enemy's reserves; and adding, "for the defensive it is most important."

Ammunition can be supplied under cover; and the assailant must form his attack formation earlier, and troops will sooner get out of hand.

Thus von Boguslawski gives the following distances for effective fire:

When on the offensive—no firing till within 440 yards; or in a long hanging action, 600 yards.

When in pursuit, fire up to 770 yards; and against artillery, or columns, to 880 yards. When on defensive, fire to 770 yards.

Horsetzki says: Fire only by order. Marksmen to fire at large objects at 1,200 yards. All soldiers to fire at large objects at 1,000 yards. From 1,000 to 300 yards assailants fire by pelotons. From 1,000 to 800 yards defenders fire by pelotons. In truth the rights of this question cannot be solved by formula. They will vary with every factor. The power of the rifle; character and command of ground; discipline of the army, and even the state of the weather.

If troops on the defensive are under cover or entrenched, with plenty of ammunition, a good view of the ground in front, and skilled in the use of the rifle, it would be foolish not to use the powers of the arm up to their extreme range. And again, when troops are attacking, are in constant movement—changing the range every five minutes, unable to replace their ammunition—it would be foolish to waste rounds by shooting unsteadily at an ever-changing distance.



We may therefore sum up shortly by stating that long-range fire confers more advantages upon the defence than upon the offence.

I may here mention the results of some experiments made with the Werndl rifle in Austria.

A company, complete to war strength, was paraded and ordered to fire at screens representing a half battery of artillery at 1,400 metres, or 1,875 paces. 211 men of the company were armed with the rifle, and 10 shots per man fired; total, 2,110 shots.

On examining the target, after  $3\frac{1}{2}$  minutes, 189 hits were found, or 9 per cent. of the shots fired; and all the men and horses were struck.

The battery then was made to advance to 900 metres, or 1,200 paces, and five rounds were fired, independently and in volleys, and at the end of the time the battery was out of action.

If soldiers can be trained to fire with such effect, it is evident that field artillery will receive a very sensible check, in its sphere of usefulness, on the battle-field; but, in any case, it must be confessed that the range and accuracy that rifles now possess have conferred a power upon infantry that was never suspected, and has not, by any means, reached its limit of development.

We will now take the breech-loaders in defence, and show what qualities are essential to troops to enable them to make the best use of the arm they carry. And, although my remarks will be, I believe, general in their application, we may, with advantage, consider them with reference to our own national wants; and I consider, therefore, the defence to be the defence of this country.

If, for the sake of argument, we consider the invasion of these shores as a fact, what troops have we for our defence? We must assume our Regular Army engaged elsewhere. A considerable part of our Militia, having volunteered to do garrison duty, with a view to relieving troops of the line, and this country left with the Household Cavalry and Infantry not sent to the field, a certain number of old and very young soldiers at Aldershot and at the various brigade depôts, the Yeomanry, some Militia regiments, and our Volunteers.

Colonel Fletcher told us, in his lecture on the "Disposition and place of the Reserve in Time of War," that, by a calculation made, it was found that every twelve months' fighting required the replacement of 75 per cent. of the Service Army, to keep its numbers up to the war strength. And therefore, if we had 60,000 on service, we should require 45,000 more every year.

If this be true, it is idle to rely upon the enlisted soldiery for the defence of this country. The Reserve, by our hypothesis, is already in the ranks, and has therefore served its purpose. Of the Militia branch, the Reserve would be called up, and would take its share of duty, and many men would, doubtless, volunteer to join the Service Army, from the Militia and its Reserve.

There remain the Volunteers, 190,000 strong.

Putting the matter broadly, there appears to be no doubt that we should, for the defence of the country, have to rely mainly upon the Volunteers, and upon the drilled men who have passed through their ranks.

What would such a force, armed with breech-loaders, require to give it a reasonable chance of success against an equally good arm?

- (1.) Organization.
- (2.) Skill in the use of the rifle.
- (3.) Discipline.

I make no doubt whatever that organization is the first essential. We have a force, 200,000 strong, in the United Kingdom, of men in the prime of life, drilled and accustomed to wear uniform.

The Volunteers look upon their service in the light of a duty or time-tax due to their country, and it further appears that such service is grateful to them, and that, in almost all cases, they consider the portion of their year spent in uniform as part of their recreation, in so far that the duties and responsibilities of life are in no way prejudicially affected by their volunteer service. The country supports the movement and encourages the continually-increasing efficiency by certain money allowances to such Volunteers as satisfy a certain standard fixed upon by it.

But the laws that regulate enlistments for the Army are equally cogent for the Volunteers. And just as the bulk of our recruits comes from the centres of populations or from towns, so are the Volunteer Corps principally found in towns; and of the country corps, if we went into statistics, we should find the greater portion resident in towns.

From this fact, that Volunteers, as a rule, are dwellers in towns, we shall find there are advantages and disadvantages.

- (1.) It is easier for them to concentrate for drill.
- (2.) They are well educated and intelligent, and, therefore, they learn drill in a very short time.

And, on the other hand, their intelligence imbues them strongly with the desire for knowledge, and, impressed with a sense of their numbers and the gratuitous character of their service, they expect more appreciation and information than as soldiers they are likely to receive. But it is clear to my mind that the Commanding Officer of each corps which, or a part of which, would be approved for service, should be in possession of certain information, in the event of its services being required, *i.e.*, the part of the country which would form his head-quarters, the duties that his corps would have to undertake, whether garrison or field duties; and if a scheme of defence of this country were elaborated, which supplied such information, I think that much special knowledge of country roads, &c., would then be found amongst Volunteers which, in a time of invasion, would be invaluable, both for them and for their superiors.

We next come to skill in the use of the rifle. This speaks for itself; and, thanks to the Wimbledon Meeting, the efforts of the National Rifle and of other Associations in this country, rifle shooting has become most popular, and I should not think that any country in Europe has acquired so great a proficiency in rifle shooting as we have.

Lastly, I come to the question of discipline, without which individual fighting would be the ruin alike of our Army and our country.

In individual fighting, discipline is ten times more important than it ever was, and this must be not only understood but personally acquiesced in and conceded by every individual.

But, in considering the subject of discipline and instruction, we find that our Reserve forces are the exact converse of our regular Army. For whereas in the latter, from the circumstances of their enlistment, intelligence is rare, and it is found difficult to attain any high standard of military education, while, from their habits of life in barracks, they rapidly learn the principles of discipline; in the Reserve there is a high standard of intelligence, which renders the acquisition of the principles of military drill, &c., comparatively easy, while from their habits of civil life they learn the principles of discipline with difficulty. For this there is (in peace-time at all events) no remedy, except in the personal worth and character of each Volunteer, and in the high aim and ambition of the Volunteers generally to be in their generation, of service to their country as defenders of its soil. In short, they must agree with Boguslawski, who says in his last book: "Skill in individual fighting is the keystone of modern warfare."

"Increased self-reliance is essential. Skill in the use of the rifle necessitates an acquaintance with the elements of tactics in each individual; and lastly, a perfect physical training by means of gymnastics, and a mental training by means of instruction and education is requisite."

"All these qualities, however, must be controlled by the cement of a strict discipline, a compact connection in close formations, and strict obedience and inventiveness in those in open order."

Just consider for a moment what the vicissitudes of this last campaign have been. In my opinion, there has not for many years been any war in which, at so great an expenditure of blood, money, and at the price of so vast an amount of misery, so small a result, even in military science, is forthcoming.

The Russian Army, claiming to have an enormous superiority of numbers, poured down over the Pruth and Danube, was checked for months by a force of Turks who happened to occupy a position at Plevna, and who determined to keep it because their enemies were so determined to turn them out.

It was the Russians who taught the Turks the importance of Plevna; and I have little doubt that, if all the Turkish Generals had acted as honestly and as loyally to their country as did the men under their command, and had Suleiman Pasha thrown his forces either to the east to help Mehemet Ali on the Lom, or to the west to Osman Pasha, in the middle or end of September, that the Russians would be wintering in Roumania, instead of being at the gates of Constantinople. I merely instance this case of Plevna to show what may be accomplished by brave men in their own country, without transport organization, and indeed almost without the power of moving, if only they are well armed, have stout hearts, and, above all, have a national aptitude for fighting and for obedience.

Gentlemen, I have little more to say. I am deeply grateful to the Officers who have been good enough to come here to listen to my



remarks, and I only regret that I should not have been better able to do justice to the subject. I have brought it forward because I feel strongly that the military forces of this country belong to two categories—the Regulars and the Auxiliaries; that the Regulars are well disciplined, but, as compared with armies based on conscription, may be said to be relatively wanting in intelligence and education, and that the auxiliaries, on the other hand, are intelligent and educated, but want more discipline. The remedy, in each case, is in our own hands.

Lieutenant-General BEAUCHAMP WALKER, C.B.: I have read with very great attention the first part of Colonel Clive's lecture, and I wish to say a few words on the question of large or small companies, but I do so with great diffidence, because I have not devoted critical thought to the subject until quite recently. While I was in Germany my time was fully occupied in considering and reporting on what the large companies *did*. I found them and I studied them. I was not asked for any opinion as to whether the system of small companies was suited to the tactics of the day, or whether the large companies would fit into the English organization, and, although I reported very exhaustively on the general subject of infantry drill, I did no more as regards the general principles than the details of the unit. In fact, I reported on what I saw and what came under my observation without putting forward my own theories. I returned to England without having come to any very decided conclusion, and should probably have continued, I will not say indifferent, but passive in the matter, had it not been for a remark made to me one day while lunching at my club. My neighbour asked me for my opinion on the subject. After saying to him in reply very much what I have just said, I added, "But you know that I have given great attention to cavalry tactics, and I have no doubt on the subject of the squadron as the administrative and tactical unit." To this my neighbour at once replied, "Then on a like process of reasoning you must be an advocate of large companies." I said nothing at the time, but the conversation set me thinking, and I have formed a pretty decided conclusion. As an administrative unit I prefer the larger, also that the administrative and tactical unit should be identical. The Captain drills his own recruits, adjudicates on all minor cases of breach of discipline, and generally administers all the affairs of the company, thereby reducing the necessity for a large battalion staff in relieving the battalion commander from many small details, at the same time acquiring an authority over his men which cannot be otherwise than beneficial. In so far, the case of the large company and of the squadron are analogous. The large companies of that foreign army with which I have the most intimate acquaintance are commanded by a mounted Captain. Up to a very recent period the commencement of field manœuvres was the signal for bringing up the Captains' horses from the rear of the battalion. I am very much mistaken if the day is not very near at hand when the commencement of manœuvring under fire will be the signal for sending the Captains' horses to the rear, on the common sense ground that the mounted Captain is a certain mark for the enemy's fire, and that it is not desirable to have the leaders of your unit unnecessarily exposed. A Captain on foot can retain very little personal control over a company of 250 men. That the large units of the German infantry do get out of hand is an indisputable fact. No one laid more stress on this fact than the author of the "Tactical Retrospect." The limit of the tactical unit is, in my opinion, the limit of control. Now, a squadron leader is perfectly capable, by voice and gesture and trumpet (of the latter the less the better on the battle-field), of controlling and keeping in hand a squadron of cavalry; that is to say, he can make himself heard and seen by the leader of each of the sub-units. Indeed a squadron, well led, ought never to get out of the squadron-leader's hand until it is broken up in the *mêlée*. But the very extended nature of infantry drill now tends to the loosening of control. Twelve years ago, when the arms of precision were far inferior to those since introduced, when it was still customary for the Captains to remain mounted under fire, control was already a difficulty. The difficulty became more and more patent during the great campaign of 1870-1. I am firmly of opinion that

no prudent nation will from henceforth force the leaders of companies, nay, perhaps even battalions, mounted, into fire. It was never supposed that Captains could have controlled companies of 250 men unless they had been mounted; and, as I doubt the possibility of their being able to continue mounted amongst their dismounted men without the certainty of their being picked off at the very commencement of an engagement, I think that I am justified in assuming that the question of large or smaller companies is by no means definitively settled in favour of the larger companies. At any rate, I feel justified in asserting the proposition that the companies must be fixed at a strength which will admit the possibility of a sufficient control by their leader when fighting among them on foot. I certainly was under the impression that the losses in 1866 amongst the mounted Field Officers and Captains had been very much greater in proportion than that amongst the subalterns, and from a cursory examination of the lists of killed and wounded during the late campaign I formed the same conclusion, and was prepared to say that that was the case. My friend, Sir Lumley Graham, however, brought me the other day extracts from the actual lists of killed and wounded in the different ranks of the Prussian Army, and he assures me that the loss amongst the Captains was not so great as that amongst the subalterns, whilst the loss amongst the Field Officers was greatest of all. I hope, if he is present, he will mention the facts, because there is nothing like fair discussion of every subject.

Colonel Sir LUMLEY GRAHAM: As General Walker has stated, he was under the impression that the loss amongst the Captains and the Field Officers in the late war was in much larger proportion than the loss amongst the other Officers, and he was inclined to think that that was due to the Captains being mounted in action. Now, with all due deference to General Walker—he did not speak positively on the subject or I should not venture to question it—with all due deference to him, I think the Captains in the war of 1871 were not as a rule mounted, and I think the following statistics rather go to support that view. There are other persons in the room who saw a great deal of that war, and I think they can give us certain information on the subject. The German official account of the losses of their Army states that the deaths from all causes per 1,000 were amongst the Field Officers 105·18, Captains, horse and foot, 86·23, amongst the Lieutenants 88·69, and non-commissioned officers, rank and file, 48·01. Now we come to another table showing the deaths by violence, and that stands as follows:—Field Officers 96·29, Captains 78·99, Lieutenants 80·52, non-commissioned officers, rank and file, 31·17. Those tables seem to show that the Captains could not, as a rule, have been mounted in action, otherwise their loss would have been likely to have been larger than that of Field Officers, as they would be more exposed in the front lines of battle.

The CHAIRMAN: Were those Captains of all branches of the service?

Sir LUMLEY GRAHAM: Captains of horse and foot.

The CHAIRMAN: Including cavalry and artillery and the train, I suppose, too?

Sir LUMLEY GRAHAM: I presume so. We all know that the loss in infantry is in very much larger proportion than that of all the other arms. I wish now, with your permission, to say a few words on the general subject. I read with great interest Colonel Clive's lecture, but I will only speak on one branch, because the whole subject is much too comprehensive to be treated in ten minutes. One subject upon which I feel strongly is that of the company organization, and, like Colonel Clive, I am very much inclined to support the organization of battalions in few companies and large companies. I know a very large number of Officers of great experience take an opposite view, but the question seems to me to resolve itself into this:—We are all agreed that the company has become a more important tactical unit than the battalion, and, I think, we are all agreed that the stronger the company can be, as long as it can be controlled by an Officer on foot, the better. The battalion is now more an administrative unit and it is not convenient that it should exceed something like 1,000 strong. Given the maximum strength of a company that can be controlled by an Officer on foot and the strength of a battalion at 1,000, we have thus two known quantities in order to arrive at the number of companies in a battalion. The question lies between four strong companies of about 250, and eight companies of about 125 of all ranks. The German and all foreign Powers have adopted the larger strength, and they form the battalion into

four companies. We are about the only great nation that still sticks to the small company, and if we can convince ourselves that the large company can be controlled by the Officer on foot, I think we ought to be convinced of the superiority of the large company over the small one. That is the question we have to decide. No doubt, as General Walker has said, and as we have all read, the Germans found very great difficulty in controlling those large companies in action, but still they did manage and control them pretty well. If the Captains had not managed to control their companies they would not have succeeded in gaining those great victories. Wherever the German infantry met the French infantry there is no doubt the German infantry beat the French infantry on its own merits. It appears to me the way in which the Germans arrive at control over large companies is by very careful previous training, and by dividing the responsibility of command in the companies. We know that their divisions, and their half divisions, and sections, and their half sections each have a leader. This leader, in action and on the drill-ground, is responsible for his particular body. It is by the careful training of these sub-leaders that the German Captain manages to control the large company. That is shown in a very interesting paper written by Colonel Lonsdale Hale, a *précis* of a series of articles which have appeared in the *Revue Militaire de l'Etranger*, and this gives a most minute account of all the interior economy of the Prussian company, and of all the excessively careful training given by Prussian Captains to the subalterns and men. I dare say most of you have read it, those who have not will do well to do so, and you will find in that article the secret of how to control large companies. Of course, under our present system of Army Organization, our Captains could not control those large companies, because they have not the military education to enable them to do so, and the men would not be controlled—the non-commissioned officers and subalterns not being sufficiently trained. One of the strongest arguments to my mind in favour of the strong company is, that it enables you in peace-time to give so much higher training to Officers and men. With our small companies (at the lowest peace footing, some 60 rank and file,) you will see a company day after day showing three or four files on parade. For drill purposes two or three companies have to be put together, the Captain never gets an opportunity of having “company drill,” or of giving “company instruction,” and the consequence is, such a thing is at present almost unknown in our Army. That reduces the value of our companies very much. The effect of introducing the large company system would give an immense impulse to military efficiency, and that, to me, is about the strongest argument in favour of introducing the large company system. There is one thing to be said. At this moment things look threatening, there is a possibility of war, and I should think, even if there were an idea of adopting the four-company system, we should be very unwise in making such a change at this moment. These changes ought to be made immediately after a war. The Germans set us the example of that, they made all sorts of changes. Though they were so successful in their two last wars, they saw that there were improvements to be made and they set about those improvements at once. That is what we must do after our next war and not now if a war is approaching. The Russians did something of that sort just before the Crimean War, and they suffered from it. They adopted at that time the Prussian system of large companies and company columns; being new at it, it did not work well at the Alma, still less at Inkerman, they suffered very much from doing that, so that whatever changes we make, should be made after the war and not immediately before it. Allow me to say one word more with reference to what Colonel Clive mentioned, as to long range and short range firing. Colonel Clive did not, I think, mention that the Germans are much in favour of firing volleys at the long ranges, nor that they have lately been experimentalising on a system of firing such volleys, with sights adjusted to three different ranges, a portion of the firing party being told off to each range, thus covering a space of, say between 600 and 800 yards, and providing against any error in judging distance. That seems rather an important idea, and it is one which some of their Officers favour very much indeed.

Major-General Cox, C.B.: The subject for discussion this afternoon, may, I presume, be reduced to the simple question as to the proper strength of a company for the British Army, and the proper way to make use of such a company. The



influence of breech-loaders, of course, is very great over all branches of the Service, and affects other branches almost as much as it does the infantry, but in the present instance I will merely state what I think should be the strength of a company of infantry. It appears to me, that whatever may be best for other armies, the most suitable strength for a company of British infantry is one which would put about a hundred men in the field, on parade or in action. It will be necessary, of course, to have a good many more, and taking into consideration sick, non-combatants, and employed men of various descriptions, such as transport men—and the number of employed men, I fancy, is rather increasing than diminishing—taking these numbers into consideration, the company should probably have about 130 or 140 men, so that you can always put 100 men on parade or in the field. A Lieutenant-Colonel, with one Major, should very easily control eight of these companies, either in peace or war.

There are several objections which occur to me against our having companies of the strength of a German company, that is to say, from 200 to 250 or more, and these objections I will mention as briefly as I can. In the first place, I think a company of about 200 men is unwieldy, and more than one Captain can efficiently and properly control and command. In saying this, I think a Captain ought to do even more than he at present does to his company. He ought to be almost all in all to his company, and ought to be not only responsible, as at present, for their arms, accoutrements, and messing, but he ought to be their drill and musketry instructor, and their instructor in other branches of their profession. Of course he could not do this alone, but the Captain should be the responsible person, and the subalterns ought to be his assistant instructors in these respects. The Captain ought so far to have the company at his disposal, that he can take them out or educate them in any way he pleases, say once or twice a week. The person to be looked to for any fault in the company is the Captain of the company. If the drill is badly performed, it should be asked, why does not the Captain see that the men are properly drilled? and similarly if anything else goes wrong with the company.

In the second place, I think companies, such as the Germans or the French, are unsuitable to the requirements of the British Service, and in this way. We are frequently required to give small detachments; in parts of the United Kingdom, say Ireland (and in many of the Colonies), there are constantly occasions when one has to detach 100 men, or 60 men, or very much less, at all events, than 200. If you want to send a large detachment anywhere, it is very easy to send two companies, but it is not so easy and it breaks up the organization completely if you send half companies or quarter companies to different stations. Therefore, for this reason also, I think it better to have a company of about 100 or a little more than 100 men.

Another thing is this, the efficiency and destructiveness of the breech-loader increases the difficulty of control. Now, instead of increasing the difficulty of control, we ought rather to seek to diminish that difficulty, and, *primâ facie*, the means to do that would seem to be to reduce the number to be controlled and not increase that number. It constantly is necessary in the British Service to act with small detachments and small forces. We, more than any Army in the world, have to do with petty wars; we have to conduct bush fighting, such as is going on at present at the Cape. It seems to me in such warfare as that, it is just as much as one Captain can do, with the ordinary staff of Officers and non-commissioned officers, to efficiently control 100 men in action or in the bush.

The last reason I should give is one which I feel a great difficulty in bringing forward, as I know that the contrary opinion is held by many high authorities in foreign Armies, and also by very able Officers in our own, and that is a question of tactics. It seems to be universally conceded that all fighting, or almost all fighting, will be in open order—the greater part of every action, at all events, will be conducted in open order—this open order consisting of skirmishers, supports, and reserve. Now, although the proportions of these may differ slightly, we may assume the skirmishing or fighting line will be one-fourth of the force, the support another quarter, and the reserve the remaining half. Now, one reason assigned by the lecturer and others, for having very strong companies, is that each company should furnish its own supports, skirmishers, and reserve. From this I beg to differ slightly, as I do not think a company ought to furnish its own support and

reserve, as well as its skirmishers. Supposing a company to be in skirmishing order, two sections or half the company being in reserve, the post of the Captain of the company would naturally be with the reserve; how then is a Captain on foot, whose means of control are limited to voice, whistle, or signal, to control his skirmishers and supports, especially when fighting or firing is going on, the skirmishers whom he would nominally control being, say, 500 yards away from him? It is perfectly impossible that he can do that. Then again, it may be said that a Captain should be mounted. Even supposing that he would exist for any time mounted with skirmishers, it seems to me that this would break our whole system of organization. If every Captain was mounted and was to command 250 men, there would be an outcry before a fortnight was over that all Captains should be made Majors, and very naturally so. I am sure I should join in it if I was a Captain. That appears to me to be a great difficulty in having skirmishers, supports, and reserve all from the same company; the Captain could not possibly control three lines together, because he would be at least 500 yards away from one or other part of the line. Then, though I see no objection, in fact, I think it would be a very desirable thing for the skirmishers and supports to be of the same company, I do not think the reserves ought to be. Skirmishers and supports may very well be of the same company, because I believe the duty of the supports to be simply to feed the fighting line, that is, that they should be under the control of the Captain of the company, who would send as many men as were necessary to fill up any gaps, or temporarily to strengthen any part of the line. He could send one man or a dozen men to any part to fill a small gap, therefore, I think skirmishers and supports may very well be under the control of the Captain of the company. On the other hand, I think the reserve should be immediately under the control of the Colonel of the battalion. The Colonel of the battalion being mounted, and being not more interested in one company than another, and seeing what is going on over the whole line, would, far better than any individual Captain, be able to say what part requires reinforcement. If it were otherwise, each Captain would naturally look to his own company, and he would think that they were most requiring reinforcement, and if he was at liberty he would send the reinforcement to them, so that when the Colonel wanted the reserve for any particular purpose he would find the Captain had sent them all into the fight, and that there was no reserve to fall back on. I think, therefore, the reserve should be under the exclusive control of the Colonel of the regiment. Another reason for that is this, that four small reserves, formed by the reserves of four different companies, would not be anything like so efficient as one strong reserve, or even two, supposing they were worked by half battalions. The Colonel is the Officer who sees where the decisive attack is to be made, and having the reserve under his control, he would be able to direct the whole of them together on that point at his own discretion, under orders of his superior Officer. As regards the line formed by the skirmishers, half a company, such as I have mentioned, would be about the proper length which could be easily controlled by one Officer—50 men would occupy about the space which one Officer could efficiently control.

Lieutenant-Colonel BLUNDELL, Grenadier Guards: I will not touch upon the lecture of to-day further than to say I think it would be a good thing if the pay-sergeant of a company had always a round of ammunition in his pouch for each man of his company, to prevent its being ever absolutely without ammunition. With reference to the former lecture, my excuse for troubling you is, I have taken great interest in this subject for some time, and wrote upon it in 1872, feeling as Colonel Clive has felt, that there was a necessity for a smaller "tactical unit" for infantry, a smaller "unit of force,"<sup>1</sup> as it is called; but also feeling, contrary to the opinion that he has arrived at, that that was not to be obtained by increasing the size of the company. With regard to the strength of the battalion, the weight of authority has always been in favour of small battalions. The Duke of Wellington said, if you have

<sup>1</sup> A technical expression, sometimes used by military writers to denote the body of men which, when manœuvring in close order, moves at the word of command of one Officer. In the British Service it has been the Lieutenant-Colonel's command, and called the "battalion."

twelve companies, make them into two battalions: they are "much more manageable" in manœuvre." Napoleon said the front of a battalion should be 130 yards, Frederick the Great, 120 yards. Every writer on the subject agrees it should be such a length as can be controlled by voice and gesture, and that any mistake in it can be rapidly corrected by its commander. Supposing we assume 130 yards as the front of a battalion as what a man can control by voice and gesture, we find that 400 men in close order approximates to that length. All the arguments that used to apply in favour of that length still hold with regard to the line of route, marching along a road or manœuvring in close order. The question of length depends upon physical conditions, and no change in arms can alter them. Our present "field exercise" may be termed a permissive act. It permits almost anything; it allows, and wisely, Officers to adapt their dispositions to the circumstances and to the ground, but it assumes that the Officer commanding what we term the battalion will command it directly by his own word of command in manœuvre, and up to the moment of entering upon the attack, the formation of which is completed at 2,000 yards from the enemy. I believe that if this discussion were to lead to a rule that on the column of route or in manœuvre, a Commanding Officer should move his command in half-battalions under the Major, if he has more than, say, 400 men, it would do immense good, because everybody must admit that it is possible to be attacked on the line of route, and there is not an Officer who has been in a large long battalion of 800 men who has not felt that there was a certain tardiness in the movement. And in the present day it is almost more important to be able rapidly to assume whatever formation circumstances require than to have any stereotyped formation; therefore, I think that if it was ruled that a Lieutenant-Colonel should never command his whole command directly—that is, by his own word of command—if it is over 400 men, great good would result. But when it comes to the question of increasing the company, I differ entirely, and for many reasons. I contend that just as you find the limit of the line of a battalion in close order to depend upon the voice of an Officer and his power of control, that the same thing applies exactly to the front fighting line. I contend that a Captain cannot command more than a line of 130 yards; that he can only command the men with whom he is. A Captain should be *with* his men. I cannot believe in a Captain who is not with his men. If he is 500 or 600 yards<sup>1</sup> in the rear he cannot control them. He may be a Captain in the general sense that all military leaders are captains, but not in the true acceptance of the word. Many people who go in for the large company contend that there is great advantage in the support and reserve coming from the same company, as it is called. I will read you a few lines from the "Tactical Retrospect" on that point. It is a treatise that has been much spoken of:

"In this striving of the supports and reserves to force themselves forward into the fighting line lies the impossibility of preserving the old-fashioned order of battle, or even the primitive tactical formation.

"Every division in the rear which has hitherto remained in close column rushes in where necessity or a possibility shows itself. An interchange between the engaged line and its supports is evidently impossible; there is not even the smallest guarantee that a company will fight together with the skirmishers which it has itself thrown out, or that the companies of a battalion, or the battalions of a regiment will ever come together. Let any one compare the state of every single battle of 1866, with regard to the positions of every division of the army after the troops had been well engaged, and the old-fashioned order of battle."

Therefore I maintain its front fighting line should be the smallest complete integral fraction of the regiment. If it becomes separated, there it is, a complete military body. It has a name; you can speak to it—A company, B company, or whatever it may be. It will not do to say "the right or the left squad or subdivision" of such and such a company. I contend, therefore, that it should not exceed what would produce, say, forty files in fighting formation, which would be, at our interval of

<sup>1</sup> Let those who think that a Captain can control his company of 250 men through a depth of 500 yards read Chapter IV, von Boguslawski, on the conduct of infantry in battle, particularly pages 77 and 80.



3½ yards, about 130 yards.<sup>1</sup> There is a great difficulty in any military discussion, the same one that I believe is found in all clerical discussions—terms are so confusing. For instance, we say the Lieutenant-Colonel commands a battalion. Now, every battalion in our service, except in the Guards, is a regiment, just as much as a Lieutenant-Colonel's command in cavalry is a regiment, and tactically a battalion of Guards is so too. That is to say, no regimental authority on parade is superior to its Lieutenant-Colonel. If it was called a regiment, I believe things would be much simplified.<sup>2</sup> People attribute to the Prussian company as a merit, its being a company, whereas I submit that to be its defect, and that its merit was that it *acted as a small battalion*. Many people look upon the large company as a modern invention, like the needle-gun, instead of a thing that came down from long ago, which was seized upon with the promptitude of genius by Moltke as furnishing what he then wanted, *small columns*. I will read to you what he says about it. He had been discussing the English advance at the Alma, and the great difficulty of advancing in line with any length of front, and he says :—"From these experiences we infer now as "heretofore the column formation affords the best means of handling troops, both "in an attack and in an actual fight. Although the fire of artillery at long ranges "forces a column into an early deployment, yet it does not prevent the approach of "a line of columns so small as to be able frequently to obtain cover from the "inequalities of the ground, and to advance with great rapidity. . . . The "system of company columns . . . is adapted to meet all these contingencies."—"Observations on the Influence that Arms of Precision have on Modern Tactics." By Field-Marshal Baron von Moltke. July, 1865. Translated by Lieut. H. R. Crawford, R.A.)

Therefore it was not its being a company, but its forming a small column which could advance with great rapidity that commended the Prussian company to Moltke. The Prussian company, I am bound to say, I believe in matter of size to be a very perfect military body. In the English Service 32 files has always been considered the very best size for what we term a company. Supposing 4 companies of 32 files formed into a small battalion, under a Major, you would have the same number of men as you have in the Prussian company within a few. There would be one company in the front attacking line, one of equal size in support, and two in the rear as the reserve. That would form a perfect part in the regular attack of a line of battle, and I believe would be found excellent; and if for the moment we used our half-battalion, that it would supply us very nearly with that,<sup>3</sup> and that in our present drill the only thing that would be necessary would be to bring both half-battalions alongside each other, and attack precisely according to the drill-book.<sup>4</sup> Having said I believe with the large company the Captain cannot command it tactically, because he cannot exercise control over 500 yards of ground in depth, I say also he cannot command it in an administrative sense. In our companies the Captain knows the name, the face, the character of every man in his company, or at least many do; they know whether a man is near-sighted, whether he is deaf, whether he is intelligent, whether he is quick. They know all that, and if they do not know it, the colour-sergeant does, so that this knowledge is at their disposal. I contend that this is an immense advantage. Some men have great aptitude in learning all this kind of

<sup>1</sup> This applies to the first action of a war. The cadre, it is to be feared, is never too full as war continues.

<sup>2</sup> It would then be possible to call what is now termed the half-battalion of four companies the battalion, which, led by a Major, would be the normal unit of force for infantry when regiments were at the war strength, and like the squadron in cavalry, would be intermediate between the Lieutenant-Colonel's and the Captain's commands, but would have, as Marmont wanted the squadron to have, a commander superior to the leaders of troops.

<sup>3</sup> The system of voluntary enlistment in the British Service cannot be relied upon to fill up regiments as a compulsory system does. However, as long as the small company is retained, the Lieutenant-Colonel can subdivide his command into such bodies as he thinks best.

<sup>4</sup> The effect of this would be to keep each half-battalion separate as far as practicable.

information, and it is possible for a Captain in peace-time to learn it with regard to 250 men ; but supposing him killed in action with the four-company system, it is three to one his successor comes out of another company. He cannot acquire all that knowledge which with a small company he would acquire, in some degree, in a fortnight or so. He would shrink at the task, and never attempt it. Therefore I contend most distinctly the company should not be more than a Captain can tactically supervise in the front attacking line, as it cannot count with certainty upon anything in rear joining it, and he cannot efficiently administer a larger command in time of war.

Major-General the Hon. PERCY FIELDING, C.B. : I was unfortunately detained at the Stafford House Committee, and so missed the commencement of this discussion, and fear lest the few remarks that I shall venture to offer may have been made already by some one else. I was, however, in time to hear Sir Lumley Graham, and I feel sure that we must all agree with him in one respect, viz., that whatever alterations it might be advisable to make as regards the strength of companies, this is not the time to make them. There is, however, another consideration which, in my humble opinion, is of much more importance than the actual size of a company, and that is the manner in which it is led. Ever since I joined the Army, thirty-two years ago, Captains of companies have been educated in the belief that their duties in the field were restricted to the carrying out such orders as they might receive from their superior Officers. What we want is to bring to bear the intelligence of the Officers, so as to make the most of the soldiers under their control and management, and I submit that the change in modern tactics renders it most essential that more scope should be allowed to Officers for the exercise of their judgment and intelligence than has hitherto been considered necessary or admissible. I have commanded a brigade at two or three of our autumn manœuvres, and at the field days have almost invariably observed that not only the brigades, but the individual battalions composing them, generally got more or less out of hand, consequent on extension and mixing up, and that mistakes arose which would not have been made if Officers commanding companies did not feel themselves so tied down to wait for orders. Many of the mistakes I have seen made at manœuvres and sham fights would doubtless not have occurred in real warfare, because not only the Officers, but the men under their command, seeing the enemy, would act more readily according to the dictates of their intelligence, but if we believe that such would be the case, I think that there is the more reason why the practice in peace manœuvres should be that which we would wish it to be in actual warfare, especially as it must be far easier for a Commanding Officer to correct a mistake made by one of his Captains than to send definite orders to each of them individually when the battalion is in extended formation.

Lieutenant-Colonel C. B. BRACKENBURY, R.A. : In any case I should have very few words to say, and the last speaker has taken many of those words out of my mouth. I did not perceive in the lecture which has been read that the value of large companies was put forward as the only topic for discussion. There are many other topics in the lecture which appear to me of even greater interest and importance. It is evident, however, that this subject must be exercising the minds of everybody in the room, from the fact that everybody appears inclined to speak. However this may be, I think it would be very rash to take the subject up now, or to alter our battalions in any respect at present. There is an old saying of President Lincoln's that we should not "swap horses while crossing a stream," and we seem to have a very ugly stream in front of us just now, so perhaps it would be quite as well not to talk about swapping horses at present. Another very distinguished man—perhaps one of the finest soldiers at this moment in Europe—General Von Kuhn, lately the Austrian Minister for War, once asked me in Vienna what we were thinking about at that time in England ; I told him the size of companies ; he said, "That is the way, "you are always looking on the ground ; it does not matter what the size of your "companies is ; you must have thoroughly good Generals and intelligent Officers, "intelligence distributed as far as possible throughout the Army, and then it matters "little what is the size of your companies." As far as my own opinions are concerned though, as an artillery Officer, the subject is one on which I speak with diffidence, I happen to have been a great deal with infantry in actual war, and per-

haps you will allow me to state them. I believe a large company would be better as a tactical unit in case of continental fighting against a civilized enemy, but the small companies may possibly be better for bush fighting, and under these circumstances it is rather difficult to say which we English should choose. There is, in short, much to be said on both sides. The paragraph which strikes me as containing the whole gist of the lecture is this :—"The real obstacle to the adoption of the formation is "that Commanding Officers cannot bear to realize that in service their commands may "melt away out of their power." I should go as far as to say they MUST melt away out of their power. I do not think I ever saw a case of a battalion or a brigade remaining in action against an enemy without getting mixed up. Whether you have only small or large companies you cannot help that, and therefore the main point to urge the Army is that every Officer, be he Captain, subaltern, or of any other rank, should be ready to make the most of the few men who at that moment are ready to his hand. One of the points which troubles the Officers of the infantry is that, in time of peace, the number of men in their companies is so small that they themselves become more or less nonentities. They are unable to take their men out to drill them tactically, or to work them in any way. That is being met at Aldershot by a system of very small manœuvres in which Captains are allowed to command men as well as their seniors, and the remedy for the complaint of the Captains may be met by a development of this practice. There is one very interesting point mentioned in to-day's lecture, but not yet noticed in discussion ; it is the power of long-range and short-range firing. So far as I have seen, the fire of the enemy is generally more dangerous at a considerable range than at a short range, provided he is not lying down behind a breastwork where he can rest the rifle and fire steadily. The men seldom aim when at close quarters ; they appear to be always anxious to have their bayonets ready to be down at the charge, and the consequence is that they scarcely ever put their rifles up to their shoulders. I have seen that both in the case of the French and the Turks. Whenever the Russians were close to the Turks, the Turks fired in that manner, whereas at a distance they fired steadily and with very fair aim. The effect of well-sustained long-range fire is very great. Such being the facts of the case, the steady supply of ammunition in the field is, to my mind, a more important element of success than the size of the company.

General Sir WILLIAM CODRINGTON : The explanation of Colonel Brackenbury's statement about the long-range firing is, no doubt, that soldiers generally will fire high, that is to say, they will not take care to aim. When the Russians reported that at the Battle of Inkerman they suffered such loss in their reserves from our far-reaching rifles, it did not arise from our seeing the reserves, at all events to aim at them, but from the quantity of fire and the high fire—you may say the incorrect fire—which passed over the heads of the front and fell among the reserves. It is a frequent fault and a bad habit of soldiers generally, and that opinion is confirmed by what Colonel Brackenbury has said with reference to the conduct of the Turks and of the French in their late wars. The main feature of present first attack, in consequence of breech-loaders, must be an open-order attack, as I should say, instead of calling them skirmishers ; that they are to be at open order and to be reinforced gradually up to what the line originally was, for the last and final rush. The difficulty is to get those men in that open order up to the formation of that more compact mass by which you must overcome the enemy who is also posted in a compact mass ; because my impression is that on no occasion have skirmishers at open order, say three paces, four paces, five paces, whatever it may be, ever successfully attacked a determined and well posted enemy in close order. Taking the usual question of the "*gros bataillons*," you must bring the men in equal or superior numbers to the point you want to take. Your skirmishers will not do that, therefore the object will be to get a combined open-order formation in the first instance, to get men to support that, and then when near the enemy, get your men into more compact formation within a short distance for the final rush. As to the size of the company, I remember when the Army was sent to the East we were in companies of 108 or 110—52 or 53 files, and that was quite as much even in common marching as any Captain could command with his voice. I should say that when you are once on service, what with sick, orderlies, and men otherwise employed, one-fourth of your company would be absent from it, and the remaining three-fourths will be all the bayonets you will get



to fight with. I therefore consider that the company of 100 or thereabouts is the company best for our service. Without going into detail of the attack, which seems to be a point on which there is great difference of opinion, it surely is a great object that the attacking portion of a company or the skirmishers, and the next open order support, and the final company reserve, should be under one similar command for administrative and military purposes, viz., by the Captain of the company. Therefore in the smaller company I think you get more direct command from your Officer and non-commissioned officers than if the company were extended over the whole front of the battalion, by which you must mix up companies when reinforcing for attack. This is the disadvantage in having the front line only formed of one company, that is to say, of the whole company. My own feeling would be to arrange that the company should have its own attacking open order, its next attacking open order, which should support the first line when necessary, and finally its reserve, which should also reinforce the attacking line or body that has to come *aux prises* with the enemy, trusting to other battalions for your reserve for another final rush or movement on a flank. That would be the business of the General, but my impression is that the company when it comes up to 100 is large enough. We must not judge by companies in peace at all. The companies in peace are sometimes about ten files, and give no practice of command.

With regard to infantry ammunition it is most essential that the supply in action should not depend upon wheel transports. We have now one cart in peace for blank cartridge, and it is, I believe, to be three in war for each battalion. In the first place we have not tried two horses with ball-cartridge ammunition for a cart, and I do not believe two horses would drag even the common ammunition cart now attached to a battalion up many of the deep sandy slopes of Aldershot with ball cartridge. If they did, they certainly would not do so very often. That weight of ammunition, viz., 16 boxes, would probably require four horses on service, and that becomes a serious business. I will now read the opinion of an Officer to whom I think credit will be given as authority, namely, the late Lord Hardinge. When I was in the Crimea, arrangements had to be made for the supply of ammunition for the future campaign; and although the Staff of the Crimea have been a little looked down upon as rather inferior, still a certain quantity of good service was done there from the beginning by the arrangements which were made. I am speaking now of an interval before I belonged to that Army. I remember seeing the great care taken by Officers of the Staff in that Army, the artillery particularly, to practise the landing of horses, guns, and supplies, and how the Staff helped in arranging every single detail. I remember also how the whole of the troops were sent on board in 100 to 120, or 130 ships that crossed the Black Sea, all of which required a very great deal of arrangement by the Staff. What did Lord Raglan do with regard to the supply of ammunition, for that is the point to which I am coming? The only *bât* animals that were taken across were 150 mules or horses for each division of the Army, for the purpose of carrying ball cartridge. They were landed and kept up with the Army as Lord Raglan had settled: they went on to the Alma, marching with the Army, crossing the Katcha and Belbec rivers, and so on to Balaklava. Afterwards, when the Army was increased, the artillery had proposed that the first reserve of ammunition for the infantry should be on wheels, horsed by the artillery, and in charge of artillery Officers; and a memorandum to this effect was sent to Lord Hardinge when this increase of the artillery and establishment was to take place. Lord Hardinge wrote,—and I quote it not as my own, but as the authority of Lord Hardinge, who certainly, from his experience in the Peninsula, and being Commander-in-Chief in England, of course wished everything to be done in the most perfect way for the Service:—"The first reserve of infantry ammunition is that of thirty rounds a man, carried on mule back, and marching with regiments, brigades, or divisions, and not with the artillery. The ammunition carried on the artillery waggons is the second reserve." Whether it be carried in rear of divisions or brigades, it is important that there should be means of moving it to the rear of a battalion on a pack animal of some sort, whether a mule or horse; and if the present preparation is really to be one for war service, pack saddles of the best sort should be provided to carry only two boxes (for if you put three boxes you will over-weight them for the march). Then you

will be able to bring them to the rear of every battalion, either under fire or in preparation for fire. In connection with this, Lord Hardinge wrote as the ground-work, and tells it very well :—"The first reserve small-arm ammunition would then be carried on mule back, with European soldiers of Land Transport Corps as conductors. A second reserve in artillery waggons, with six horses, each having 60 rounds per man, and 90 rounds in action, making in all 150 rounds per soldier." "At Almanza, Lord Peterborough's Army of 10,000 British troops was obliged to lay down its arms for want of ammunition; and I myself have seen 17,000 men men in great peril from the same cause." Therefore Lord Hardinge was also anxious that by mule back and wheels, the ammunition should be ready close to a battalion. He also makes another very pithy observation. "Troops may starve for twenty-four hours, but if for an hour they are deficient in ammunition, they are likely to be defeated." Those are Lord Hardinge's opinions with regard to the first reserve of small-arm ammunition; and I hope they will have some weight in the preparations that are now taking place.<sup>1</sup>

Lieutenant-Colonel R. HARRISON, R.E. : I should not presume to take up any of the time of this meeting were it not that nine years ago I read a paper at the War Office proposing that a company of engineers should be formed of a strength of between 200 and 240. I have lived to see five companies actually made of the strength of 202 Officers and men. When I wrote and asked whether the paper I had read might be printed, I was told that there was *no objection*, but that the use was not seen of starting a hare that *could never possibly* be caught. Well, this hare has, as I have just said, been already caught, as far as the engineers are concerned. Not being present at the first part of the lecture, I do not know exactly what Colonel Clive has put forward as to the *strength* of the company he proposes, but I am satisfied that he has done the right thing in bringing the subject forward for discussion. As to the *actual size* of the company I will not offer any opinion. All I wish to say about it is this, that the company should not be so strong as to be out of a man's hand, whether in the field employed tactically, or whether he is administering it in the barracks or the camp, and it should not be so small as to be actually insignificant. I myself have been commanding companies and similar bodies for twenty years, and I am commanding one still. On one occasion I remember the company I commanded was so reduced in numbers that I only had three men on parade to march to church after a volunteer band that the company possessed. *That* company was, no doubt, a *great deal* too small. On the other hand, I have *now* under my command 317 Officers and men and 225 horses. No doubt this unit would be a great deal too large *for infantry* to be commanded efficiently in the field. But I mention it as a practical example of how large a body *can* be commanded administratively in barracks. Certainly I have very good Officers and non-commissioned officers, or it could not be done. As I said before, I do not know *exactly* what Colonel Clive's scheme is; as a question of principle I perfectly agree with him, that is to say, it seems to me that the organization of the Army should be such as to *decentralize*. Responsibility should be thrown on *all* Officers from the time they join the Service, and on all non-commissioned officers from the time they are appointed; for by such a system only can the training, which is so important of all ranks, be thoroughly carried out—by such a system only will a General be able to command such a complicated thing as an army in the field in the present day; and by such a system only will every individual in the Army be able to carry out his own education, until by industry and diligence he renders himself fit for any command whatever.

Mr. C. B. NORMAN : Sir William Codrington is the only Officer who has touched upon the question of supplying ammunition in the field. As I have recently had an opportunity of seeing mule transport used during the Russo-Turkish War, and prior to that had the opportunity of seeing troops served with ammunition in the

<sup>1</sup> Although I did not mention the following, it is also on the same subject in Lord Hardinge's letter :—

"At Albuera men's pouches were replaced a third time. At Waterloo, La Haye Sainte was captured by the French, owing to the failure of a fresh supply of ammunition."—W. C.

field, I will say one or two words. It seems to me we do not lay enough stress upon the value of mules. There is a plan that has been tried upwards of thirty years in a portion of the British Army; it has stood the test of thirty separate expeditions on the frontier of India, as well as that of the Indian Mutiny, and I have never heard that the supply of ammunition failed the battalions of the Punjab Frontier Force. Every regiment in that force has 40 mules and 55 camels under the charge of the Quartermaster, a combatant Officer. The drivers are non-combatants. To these 40 mules there is 1 jemidar and 13 syces. Sixteen of these mules are told off for service ammunition; each carries two boxes containing three leather cartouches, which may be slung over the back of a man, and so pushed forward to supply skirmishers in the field. Each cartouche contains 35 packets, that is 350 rounds: thus each mule carries 2,100 rounds, and the sixteen 33,600, which is about 48 rounds per man taking the total strength of the battalion at 720; but as a battalion rarely goes into the field at its full strength, it really would be 50 rounds per man. In that column of the Jowaki Expedition referred to by Colonel Clive, the mules did not belong to the regiments, but in the force under General Keyes (the Kohat column) the mules did belong to the regiment, and each man had a reserve of about 50 rounds close at hand. I think that system perhaps is preferable to the one before us. The cartouches are ready filled, packed in the boxes, and when the ammunition is wanted, the Officer has merely to send a messenger to the mules' escort to ask for ammunition. These mules may be pushed up in hilly countries very close to the fighting line; the men have simply to take out the cartouches and run up to the front with them. There are many Officers here who have seen that done in service. I think we might take a hint in a good many ways from the way in which troops are equipped in India; but really I think the mule carriage of ammunition throughout is infinitely better than anything I have seen, either at Woolwich or with the Turkish Army, where there was no regularly organized system for supplying the troops in front. Some mules carried two, some four boxes; there was no authorized number; men ran back from the front, smashed open boxes, and picked up the ammunition as they could; but the system in vogue in India, and which might be tried at Aldershot now, you would find answer all the purpose. There seems to be a general consensus of opinion that now is not the time to alter companies; but now, with war staring us in the face, I think is the time to try every plan that can be brought up for supplying troops with ammunition in the field, and a plan that has stood the test of war is worth a trial.

Captain FRASER, R.E.: I should not have ventured to have expressed an opinion on this subject, but that, with a full knowledge of the importance of the question, I have lately been watching its practical solution in action, and having done so, I can fully confirm the view expressed by Colonel Brackenbury as to there being very little field for control when infantry come to close. Personal control over 100 or even fewer men in line of skirmishers, when thoroughly engaged, is, I venture to think, out of the question. The moment for control is then over and that for example has come. Success, it seemed to me, was at this stage chiefly due to the example of the bravest individuals and to the presence among the rank and file of such an instinct for fighting as seemed to give them all something of cohesion: and this, I think, is one great reason why the Turks did so well in the attack. We have been in the habit of believing that they are only good for defence. They believe the contrary themselves, and I have heard their view concurred in by German Officers who had seen them fight both offensively and defensively. The reason I take to be that Turkish soldiers have such a natural aptitude for fighting is that they go forward whether led or not. All important as the question of company organization is, as a means of launching troops most favourably into action, I still think that ultimate success will, in the main, depend on the fitness for fighting that there is in the masses; and this we should endeavour to develop in the individual by constant practical training. With regard to long-range fire, I did not myself see such results as have been mentioned. No doubt it has an enormous moral effect, because men are shot without any apparent cause. When you see men firing at you at 200 yards, you expect to be shot, and those whose comrades are shot alongside of them at all events do not then mind it so much. It is worth considering whether the moral effect of long-range fire has not caused the physical effect to be overrated. General Skobelow



complains that the Turkish infantry would not let his masses alone at a distance of 2,000 yards; but it did not much matter whether they did or not; because the existence of masses in the presence of artillery would be impossible at such a range. The question of supply of ammunition I believe to be all-important. In countries such as Turkey, it would constantly be impossible for us to drag about the heavy transport we have designed as it is for the ordinary roads of civilisation. At the battle of Kacelevo the Russians left an ambulance waggon which had been presented by some society. It was a modest vehicle, measured by the standard of London, but when we saw it there it looked like the ark on Mount Ararat, nobody could make out how it got there; everyone could see why it had stayed. So it would be with our heavy transport, and we must, I venture to think, be prepared if the ammunition is to follow troops in action, to put it altogether on horses. It is wonderful what may be done in this way. I lately saw ammunition pack horses advancing almost in the line of skirmishers; they ought to have been shot, but somehow they were not. Each company had its own pack-horses led by men of the company. Everyone fresh from the experience of the late war, will, I think, agree that we cannot attach too much importance to this part of Colonel Clive's subject on which Sir William Codrington has just thrown such an interesting light.

Lieutenant-Colonel CRICHTON, Grenadier Guards: It appears to me a great many of those Officers who have spoken to-day have rather put aside the question, what are we to do in the way of training men for fighting. Are we right in our present system, and is the present extension of the company too large or not? I maintain as an old Adjutant and now as Captain of a company that, in the first place, as an Adjutant, men, and especially young soldiers, get thoroughly confounded when supported and reinforced by other companies. If you extend a company over seventy yards, and a Captain commanding another company comes up to reinforce, the fighting line has possibly another commander, the men are mixed, and they do not know who to rely on; "Which Officer shall I take the word of command from?" I have heard fifty times in Hyde Park. If that is the case in Hyde Park, what must it be in a regular action. If you reinforce them from the rear with one or two other companies, the confusion becomes proportionately greater. I have tried a battalion thus:—On my right hand, the right half-battalion extended for attack, as per regulation drill book, one company covering its front, one in support, remainder in reserve. On my left hand, the left half-battalion with its front covered by sections of each company, extended, supported each by sections of the same companies, and with reserves made up of the rest of the half-companies. And I have no hesitation in saying the left half-battalion working in sections extended, supported by its own sections and with its own sections and with its own reserve worked steadier and better and was better in hand during and at the end of the action than the right half-battalion which was working by one large company extended first, reinforced by another company, mixed, and reinforced at the last by the rest of the half-battalion. I think I may add, I have seen a good deal of Volunteer fighting in Hyde Park, at Tring, and other places. As soon as the companies in the front fighting line were reinforced, confusion reigned supreme, there was not a chance of getting the men back or under control. I do not intend to speak against the auxiliary force. I do not suppose any of us imagine that they drill quite so smartly as the Rifle Brigade or the Guards; they do drill remarkably well, but at the same time, extend them and reinforce so as to mix companies, and I would like you to see where they get to in a sham fight in a quarter of an hour. 2ndly. As a commander of a company, my company as a rule in peace-time is extended to cover the front of the half-battalion, about 120 yards. I have very strong lungs, I have a very smart non-commissioned officer, but I have never been able to control that front properly as a Captain. In the larger company let me extend a quarter of it and I will control it; let me reinforce it by my own men, I will control them. Let me reinforce it from the rear half-company which I would have commanded by a second Captain to my company, and I would control that too. I would not reduce the number of Officers, we want Officers, and smart non-commissioned officers, in the same proportion to numbers as now, but if with such Officers I had the command of a company, of say 200 men, as Captain in time of

peace, I believe we should be able to command them thoroughly well on active service.

*Note.*—I intended to recommend, but had not time, as a step towards the larger company, a double company system *pro tem.*, that is, making two of our small companies always work together under one distinct *double company commander*, I would never allow those companies to be separated in attack drill and gradually I would blend them into one company of 200 men. This would not be at variance with our drill book, but it would make *compulsory* what is now *optional*.

Lieutenant-Colonel HALE, R.E., in a few brief remarks, supported the adoption of large companies.

Major-General R. LUARD: There is one point which I think has not been quite sufficiently brought forward. What I should like to see is more responsibility on the part of corporals over their squads and of non-commissioned officers in charge of squads. And I will go lower than the corporal of a squad: let there be comrades *always together*, and in reinforcing the skirmishing line let the men be reinforced by men of their own squad, *their own comrades*. As the men live together, let them fight together "*as comrades*." I do not think this point has been sufficiently brought forward, and it is a very important one. Take the company drawn up in line at whatever distance from the enemy; for the attack let a few men (say from the right, left, and a central squad), well in hand of a corporal, be sent out to feel for the enemy. When these men require to be reinforced, let this be done by their various squads, and when the line has been reinforced up to its full strength, the squad would stand in line of battle all together, so that every squad would have its *own* non-commissioned officer over it, every sergeant would have so many (and his *own*) squads under him. The subalterns would have so many sergeants' sections, making up their *own* subdivision under them, and the Captain would be there to superintend the whole—his *own* company. By such means when the company has finally been reinforced to the full amount, the men will be under their own Captain, and not under several and strange Captains. The result of the present system would be very well exemplified if each company of a regiment had different coloured caps, for when the reinforcements took place according to the present rules, you would see at a glance at the end of the final reinforcement, how the red caps, the white caps, the blue and yellow caps were all muddled up, whereas by the system I advocate the same coloured caps would be together, and at the supreme moment, when you have either been successful (or, unfortunately, you may not have been successful), and you want the company to act as a company under its Captain, you would then have them all together and quite handy. The comrading and the squadding together are points which I do not think were brought forward to-day, and those are the points I wish to bring to your notice.<sup>1</sup>

Captain GUNTER, 59th Regiment: There are only one or two remarks that I would venture to ask to be allowed to make. As a Captain of infantry I feel that with our present battalion organization our commands are too small for tactical requirements,

<sup>1</sup> I am not for increasing a company beyond what a Captain can well control by voice and gesture in time of battle (which I put at *about 100 men*). What I advocate is, that when in that line of battle, in order that the men may be *well in hand*, they shall find themselves alongside their comrades: and for this I would build up the company of a certain number of corporals' "squads," men who are *always* together, in barracks, tents, on parade, and in the line of battle. The "attack" to be made by sending forward a few at a time, so that when augmented up to full strength, each squad may find itself complete, irrespective of its relative position to other squads in the company. Comrades, double comrades, quadruple comrades, &c., under a corporal to form the "squad," and twelve squads, say, to form the company. Advances to attack, and *more especially* retirements after attack to be *practised continually by alternate squads*. All battalion and company movements to be subordinated to the system of attack and comrade formation. Sizing to be by squads, *not* by companies. Equalization of companies to be discontinued. Everything to teach that *as squadded*, by comradeship, *so must men fight*, under their own non-commissioned officers and Officers, and to impress this the more thoroughly, so must they "*march past*."—R. G. L.

and that larger companies would offer advantages for administration and training. At the same time I think the proposed change to four companies would give companies too large for efficient command in the field. I would venture to ask whether a useful tactical reform might not be effected by simply reducing the number of companies from eight to six, the battalion of the present strength being retained. The company might stand at war strength somewhat thus :—1 Captain, 3 Lieutenants, 3 sergeants, 3 lance-sergeants, 6 corporals, 6 lance-corporals, 3 drummers, 3 bandmen, and 3 pioneers, and 144 privates; total, about 170. Divide this company into three platoons, each commanded by an Officer, and each platoon into two sections, each commanded by a sergeant or lance-sergeant; each section into two squads, each commanded by a corporal or lance-corporal, the basis of the system being the squad of 12 men. I think the company thus formed will be found very handy for all purposes. For purposes of attack allowing about 20 per cent. for casualties before going into action, your platoons would be about 38 strong, and if you allow about two paces between the men, each platoon extended in single rank would occupy 114 paces. You might have a right and a left attack, one company in front of each attack extending two platoons in front (the Captain keeping one platoon 100 yards in rear of these as a reinforce). Two companies would cover the front of the battalion. A company extended in support about 200 yards in rear of each front company, its Captain also keeping one platoon in hand 100 yards in rear of the outer flank, to guard against any flank attack. The right attack to be commanded by the Major of the right wing, and the left attack commanded by the Major of the left wing, the commanding Officer keeping two companies in hand as a local reserve. That is merely an ideal formation. If it is considered that the companies should find their own supports, three companies might each extend one platoon in front, one platoon in support, and one in rear, the Commanding Officer keeping three companies in hand in rear for counter-attack, reinforcement, &c. I do not think myself that the system of the company finding its own support answers so well as having the supports of a separate company; but if it (the former) is considered better, the organization by six companies would be equally well adapted to that.<sup>1</sup> I think there is one thing very important, and that is that the Captains should be allowed to instruct and train their companies; they should frequently have opportunities for thorough company instruction, and to do that the Captain should be assisted by a non-commissioned officer—a company sergeant-major, who should be entirely relieved of pay duties, so that he may devote himself to the disciplining and instruction of the men. The object should be to get a thoroughly efficient company so as to give the parts of it sufficient strength to afford sufficient employment to the subordinate Officers and non-commissioned officers.

Colonel CLIVE: I regret that owing to the number of Officers who have expressed their views, and the range of subjects over which the latter have extended, that I shall not be able to answer my opponents in detail at this late hour.

I understand, however, that we are all agreed that the supply of ammunition is most important, and well worthy of experiments, with a view to ascertaining the best system for our Service, both as regards the mode and means of carriage, of distribution, and the machinery by which the latter is to be made; in other words,

<sup>1</sup> Among the reasons against forming the supports of the same companies as the skirmishers may be stated :—

1. Owing to the great difficulty of *direction* in fighting in extended order (especially in wood fighting, e.g., Wörth, Spicheren) the “supports” are after a while frequently found arriving in rear of other bodies than those in support of which they started. If formed of the same company as the skirmishers in front, a dislocation of the company thus ensues, which would not follow were they of a different company. In the latter case the supports being still whole companies keeping together, it does not signify so much. In the former case the *parts* of companies become widely separated, which is a great inconvenience.

2. The greater difficulty of keeping the men of the supports when excited from rushing on to join their comrades in front if of the same company, and prematurely taking part in the fight, which is productive of much mischief.

3. The difficulty in practice of directing both skirmishers and supports.—E. G.



whether the men that are to convey the ammunition shall belong to the company or to the battalion pioneers—buglers or drummers.

With reference to the tactical questions to which the larger number of Officers have spoken, it seems to me that the objections raised may be conveniently classified under three different heads :—

- (a.) The demerits of the four-company system ;
- (b.) The merits of the eight-company system ;
- (c.) The objection to making any immediate change.

(a.) Speaking first and principally to the first objection, the difficulty of control. General Beauchamp Walker (in whom I am sorry to find an opponent), states that the Germans have realized that Officers cannot remain mounted under fire : that a German company is too large for effective control on foot, and that, therefore, we should not increase the size of our company. To that argument I answer, that in the last war, after the first fortnight, the German Captains *did* dismount when going under fire, and yet did succeed in commanding their companies to very good purpose.

A letter from a Staff Officer at Berlin, received this day, states :—

“ In the beginning of the war our Captains of companies remained mounted while under fire. Great numbers of them were killed or wounded in the great battles in the vicinity of Metz. For this reason they were ordered to dismount and command on foot. Since that time, companies have been commanded on foot, and no particular difficulties have resulted.”

And again, a Captain in a Jäger battalion at Amanvilliers, which lost 550 out of 900 men, in killed, wounded, and missing, relates :—

“ For the most part the Captains were not mounted in the fighting line. We generally rode until we came under fire. On foot it is certainly hard to command a complete big company : but our task is lightened by the knowledge possessed by our Lieutenants. But how often is a company complete ? For instance, at the commencement of the war we used to parade about 250 men. There were always some sick, foot-sore, orderlies, &c., and after the first fight, you don't find more than 120 men or thereabouts. Therefore, personally I am convinced our present sized company is none too big, and to know all your men well, as we do, helps matters immensely. When our reserves join, we post the men to the same company in which they formerly served.”

I am glad to hear General Walker say, that in his own branch of the service, cavalry, he is in favour of the squadron being the administrative as well as the tactical unit, adding “ I prefer a large unit for cavalry,” and it appears to me difficult to draw a distinction between cavalry and infantry in the matter of fighting tactics. Major-General Cox considers a unit of 200 men unwieldy ; but, as he fixes 140 men as the most suitable strength for a unit, he probably considers our present company too weak.

(b.) Colonel Blundell, on the other hand, is satisfied with the present strength of the company, but considers the battalion too large, and, therefore, would adopt the half-battalion as the unit, with the present company as it is.

Many distinguished Officers have testified to the efficiency of our present-sized companies. Colonel Brackenbury speaks to its suitable size for bush fighting and small frontier wars ; though I do not gather from his remarks that he would recommend it as a suitable organization with which to meet a Continental Power. Sir William Codrington, in speaking for our present companies, yet allowed an expression to fall, which leads me to suppose that he would like a company to furnish its own skirmishers, supports, and reserves ; a principle which I was most happy to hear affirmed by an Officer of such distinguished service.

(c.) Lastly, all Officers have unanimously objected to making an immediate change.

Gentlemen, I hope you will think me sincere when I say that I never contemplated such a thing. Such a change in organization will require much thought and many experiments. And, moreover, much in what I believe to be the right direction, may be accomplished by working with the double company columns, *so long as the same two companies are always worked together*, in quarters, at drill, and at manœuvre, and, if possible, on detachment ; in short, if we apply our

present cavalry organization to our infantry. I advocate big companies for our service in peace and in war, for three reasons:—

- (1.) Because our battalions are too big to face the breech-loaders ;
- (2.) Because our companies are too small ;
- (3.) Because the mixing of men is, under the big company, materially diminished, and the power of control is increased.

The first statement is already sufficiently proved : and, although, I do not wish to recapitulate arguments, I must give my reasons for thinking our company too small. Our Chairman, Sir Garnet Wolseley, referred, about two months ago in this hall, to his own experiences in India.<sup>1</sup> He made three statements in the course of his remarks. That no man could personally influence men under fire for more than 50 yards on each side of him, or 100 yards altogether. That he had found, by experience, that when he had been a very short time in action, from one-third to one-half of his men were no longer under his personal control, not necessarily killed or wounded, but simply not available or subject to his influence, and that in future a Captain's command must consist of depth as well as front. Let us consider the fighting value of such a company. If a company, 100 strong, marches off parade with 75 or 80 bayonets, it will be most satisfactory. After a short time in action, from 25 to 40 of these will no longer be to the front, and there will remain some 40 or 50 men, with the work about to begin at 500 yards from the enemy. If this is the best evidence in favour of small companies when attacking sepoys with muzzle-loaders, I regret that I cannot consider it a strong case. I say the present company is too small, because there is nothing of it by the time the work begins ; and when the supports come into line, control is rendered more difficult, and with the entry of reserves in the fighting line, control is nearly impossible.

In reading the German instructions for manœuvre, I find them full of general sound principles and of large views, and only one thing strictly forbidden, and that is mixing the files "*eindoubliren rottenweise*" in the front line. Control is at all times most difficult of retention, they say, and the only chance of doing it is to keep the sub-units unmixed as long as possible.

It is, then, because a large company can play the part of a small battalion, or as well as that of an efficient company, being a mean between our battalion and our company, and will, at the same time, reduce the reinforcing difficulty to a minimum, that I advocate it as the best organization under which to meet the breech-loaders.

This system happens to belong now not only to the Germans, but to the French, Austrians, Italians, Belgians, and also, I believe, to the Turks : and, as I cannot find any weak point in it which is not as weak if not weaker under other systems, or, turning to our Service, any conditions which this European system is unable to satisfy, I should like to see experiments tried, with a view to ascertaining whether it will not also confer advantages upon the British infantry.

The CHAIRMAN : Well, gentlemen, I am sure although we may have differences of opinion as to the relative merits of strong companies *versus* small companies, we shall all agree in feeling and thinking that the lecture and discussion which has followed it, have been most interesting and valuable. I am very glad indeed that this discussion has taken place. I fully concur in the views expressed by Colonel Clive as to the discussion, and to the advisability of its taking place to-day. The real and principal reason, however, why I am glad it has taken place is this : I should have been very sorry indeed if Colonel Clive's interesting lecture of last month had been published in the Proceedings of this Institution and had gone abroad and been read all over the world without being accompanied by any statement from those who do not concur in the views he advocates. I fully concur in what has been said by so many here to-day as to the inadvisability of making any alteration of system whatever, when an enemy is preparing for a campaign ; and we all know that at this present moment affairs in the world are very critical. We have been told that war hangs in the balance, and we know not the moment when we may be forced into it. It would, therefore, be madness to attempt any alteration in our system of drill at present. I think it was Colonel Brackenbury who reminded

<sup>1</sup> See Journal, Vol. xxii, No. 96, page 580, *et seq.*

us of a very witty saying of the late President Lincoln when he was questioned as to the advisability of changing Commanders during the American War. But if it be dangerous to change your General during a campaign it would be still more fatal to attempt any change in the organization of our Army at a moment like the present. I will go further, and will add that with all due respect to Colonel Clive, for whom I have the greatest possible respect, I think the fact of this question being brought forward at all at the present moment is to be regretted, because I am afraid those who read his lecture may be liable to have their minds warped and biased by it, and their confidence shaken in the system in which they have been educated, a result that no one I am sure would regret more than himself. However, on the whole, I think the discussion has been most useful; and although I am neither judge nor jury at the present moment, I cannot help feeling that the balance of argument has been in favour of the views I myself entertain. When I think of the lecture we heard from Colonel Clive a month ago, and of the views he has brought forward to-day, and of those that have been propounded by others who defend the system of strong companies, I cannot help thinking the whole of their arguments might be almost reduced to a single one, which is this, that because the Prussian Army in 1866, and the Germans of 1870, were eminently successful, and because those two armies were organized upon the four-company system, therefore that system is much the best organization for an Army. I think that is really the whole pith of the arguments that have been brought forward. To say that the Prussians were successful on account of their battalion organization is, I think, to beg the whole question at once. We are all entitled to our opinion, and mine is in this matter that it would be quite as logical to attribute the success of the Germans to the fact of their having spiked helmets. They were successful, not because they had strong companies, but in spite of that system which I believe to be a thoroughly faulty one. One argument brought forward in support of Colonel Clive's views must, of course, be recognised by all as a strong one, it is that nearly all the Continental nations, all the great military nations of the world, have copied this system which he urges us to copy: France, Italy, Austria, and so on, have adopted this four-company formation. That would be a very strong argument in its favour if it were clearly brought home to us that this strong company system had its origin in the changes brought about in tactics by the introduction of the breech-loader into modern warfare. But so far from this being the case, I think if you will go back into history, you will find that this strong company organization existed in the Prussian Army long before breech-loaders were ever thought of. It existed in the Prussian Army when they manœuvred in strong columns and in thin lines. If you wish to account for the origin of the strong company system you must go back to the time when the Prussian nation realized the necessity for having a large Army. Prussia was very poor and very weak in that class of men from which alone they would consent to draw their Officers. In Prussia a man is not allowed to be an Officer, or certainly was not allowed to be one in those days unless he had a certain number of quarterings to his arms. The country was poor, and they were determined to have a large Army. How did they do it? In this way: they increased the number of men in their companies without increasing the number of their Officers. The Officer is a very expensive animal, whilst the private soldier, in an Army where soldiers are supplied by compulsory service, and where obligatory service is the law of the land, costs directly almost nothing. The Officer is expensive because he has to be paid well and pensioned off. That was really one of the principal reasons why the Prussians hit upon this system of four companies for their battalions; they increased the number of men in each company in the Army, but they did not increase the number of their Officers. They also suffered from a great dearth of Officers. Supposing they had said, "We will still maintain the proportion between Officers and private soldiers in "each company," they could not have found the number of Officers required for this large Army. It was, therefore, from poverty of material from which they would alone consent to manufacture Officers that this system came into operation; and I would above all things beg young Officers in our Army, who are influenced by the views brought forward in pamphlets and books upon this subject, to remember this historical fact, that the strong company system has nothing whatever to do with the introduction of breech-loading arms into the Prussian or any other Army. I think



that those who recommend this system of strong companies may very fairly be divided into two classes. First we have the enthusiastic soldier, the man highly devoted to his profession, of which my friend the lecturer and many others who have also spoken here to-day are distinguished examples—men who are sincerely desirous of making themselves efficient as soldiers, and of seeing our Army the best and most perfect in the world. The second class is far more numerous: that might easily be the case however, for I believe the number of men in our Army who defend this strong company system is very small. The second is a much larger class, and it is amongst civilians, not amongst the military, you must look for them. It is the class of would-be army reformers—men who know nothing about war or soldiers, either theoretically or practically—men who are strongly biassed—certainly many of those whom I have in my mind are so from political motives, against the British Officer generally, and who would therefore like to see their number reduced. Of course the great peg that the class of army reformers to whom I refer hang their opinions upon, is the principle of economy; they urge that the smaller the number of Officers the less the Army will cost. Economy is a subject it is very easy to preach upon. Englishmen are always very glad to listen, and John Bull is very anxious to give you a good hearing if you can propound a theory by the adoption of which it is proposed to reduce our Army expenditure. If you tell him that by following your advice he will have less taxes to pay, he naturally begins to think there is something in it, but when he is told that the system recommended to him, that of having only a small number of Officers is the system of the Army which has been the most successful in the world, and further that there are a certain number of men in our Army who advocate it, he naturally imagines there is some truth in it. He allows himself to be carried away without really knowing anything of the subject. Most of our army reformers advocate the four-company system simply because it commends itself to their notice through the saving in expenditure it would bring about, and because a few distinguished Officers, like my friend the lecturer, recommend it. Before going any further into the question, I should like to deal with this subject of the proportion of Officers to men, because that is the most important part of the question, and I would like to call attention to the manner in which I believe it would affect our Army. I had hoped that General Walker would have made some allusion to what I have always understood was a fact, that during the progress of the late war there were considerable complaints in the Prussian Army as to their paucity of Officers.

General BEAUCHAMP WALKER: The greatest possible complaint.

The CHAIRMAN: That was a point on which great stress was laid at the time. Now, if the German Army suffered from a paucity of Officers during their wars, just think of what would be the result in our Service of a reduction in the proportion of Officers. Remember the great distinction between the rank and file of our Army and those who compose the Prussian Army. In every German battalion or company, there are men drawn from all classes of society; you have the rich gentleman's son, the sons of the landed gentry, the sons of the professional man, the mechanic and labourer; whereas on the other hand in our Army where voluntary enlistment holds good we almost universally draw our men from the poorest class of society, and I may add, without wishing to say anything derogatory to the rank and file of our Army, from the most ignorant class in England. We tap only one stratum of society, whereas for the supply of men to every battalion in Germany every stratum and class of society is tapped, and the consequence is the higher intelligence of the few and the superior position of the few go to leaven the mass. The result is the mean intelligence of the men composing the Prussian company is much higher than in an English company, and I think everyone will admit that the higher the intelligence of the men, the better they are educated, the higher the social position they occupy in private life, the more easily they are commanded in action and the fewer number of Officers they require. I am sure it will be admitted that our men require more Officers than the Prussians. We are told the Prussians suffered from a paucity of Officers, and if they did, how much more should we.

There is another point connected with this part of the subject as it refers to the composition of the Prussian Army. In that Army the non-commissioned Officers

are drawn from a better class, they are better educated and therefore command much greater respect and have greater influence amongst their men than ours do. If an Officer is killed in the Prussian company, a non-commissioned officer is far better fitted to take his place than a non-commissioned officer in our ranks is. Any one here who has had much experience on active service, and who has lived, I may say, in the ranks among his men by day and night for months and months together, will recognise the truth of this, and he will, perhaps, as I can remember having heard men say, that they would infinitely prefer following the youngest joined ensign to the oldest non-commissioned officer in the regiment. If that is true, it is another reason why we should pause before we attempt to introduce into our Army any system that would tend to reduce our Officers. What I am afraid of is, that if a proposed scheme of this kind, recommended by men like Colonel Clive and others who are students of war, goes forth to a public eager for economy, this four-company system will not be judged upon its own merits, and will therefore obtain a far greater following and a far greater number of adherents than hitherto, a cry will be made to reduce the number of our Officers, and I think that no step could be more dangerous.

Colonel CLIVE: Nothing has been said about lessening the number of Officers.

The CHAIRMAN: No allusion has been made to that subject, but the two things go together, and the very fact of that not having been alluded to makes it all the more dangerous, because if this system of four companies is adopted it will most certainly lead to a considerable reduction of Officers, whether those who recommend that system from tactical reasons wish it or not. In discussions on this subject we hear a great deal about "the tactical unit." I am referring not only to the general remarks made here to-day, but also to what I have seen written about it by others. I should very much like to go round this hall and ask every man his views as to what the tactical unit consists of. I do not believe a great many have very decided views as to what a tactical unit is. As I conceive a tactical unit in infantry, it is the maximum number of men that one captain or leader, whichever you choose to call him, can actively control and lead in action. That is how many men around you can you influence? To what distance to your right or left do you influence men? If the number of men in your company, when in fighting formation, will cover a greater space than you can influence by your own presence, I say you ought to reduce the number in your company to the number that can conveniently go into that space. There is a limit to the front which we can exercise influence over, and in these days of skirmishing we know the number of men that can go in that space is very small indeed, much smaller than formerly, therefore the deductions I draw from the late wars is not that you should increase the number of your men, but that as in future all your fighting must be in skirmishing order, you should reduce the number in each company. In any given front, whether 50 or 100 yards be assumed as the limit of front over which a Captain can exert a direct influence, you cannot have as great a number of men as you used to have in former times, when you worked in close formation. The deduction I draw consequently from the late war is, that your company should be smaller than it was in those days. In former times the battalion was the tactical unit in all armies in the world. A battalion then consisted of 400 or 500 or 600 or 800 men. 600 or 700 men when in column, or formed in a rigid line, could easily in those days be commanded by a man on horseback. I think there is a consensus of opinion as to the impossibility of a man remaining on horseback under the musketry fire of the present day. A man on horseback is an impossibility under a heavy musketry fire; he would be a great target that would only exist for a very short time. In coming to an opinion on this subject you must assume it as a fact that a man cannot remain on horseback now. In the days when a Colonel rode with his regiment and commanded his battalion in line or column of 700 or 800, the noise was much less than it is now. In those days of muzzle-loaders the firing was very slow and the danger very slight compared with what it is at present, but now you can scarcely make yourself heard to a distance of more than a few yards away from you. In the Ashantee campaign, such was the continued roar of the breech-loaders, that upon several occasions one had to shout at the man near to you to make him hear. If that was the case in a small petty war, picture what it would be in a field of battle where 20,000 or 30,000 infantry are continuously

firing; it would be impossible for a man to make himself heard to any distance, whereas in those days of muzzle-loaders a man on horseback could make himself heard by his battalion. Now if a man can neither make himself seen by being mounted, nor heard to any distance owing to the roaring voice of the breech-loader, all this points to the fact that your unit should be much smaller than it was in former wars. We are all agreed that in future men can only fight in skirmishing order. The days when men advanced in line as at the Alma and elsewhere are past and gone. We must make up our minds that an action will in future be fought out by two great opposing irregularly formed lines closely packed at places and very thinly occupied at others, swaying backwards and forwards many times during the progress of the battle. Formerly one line could advance up to another almost within charging distance in close formations, but this cannot be done now. Colonel Clive laid great stress upon the assumed facility with which you will be able to control your men by having a small number of large company units. I arrive at a very different conclusion. My theory is, that when once your skirmishing line is thoroughly well engaged with the enemy's skirmishing line it will be from the rear impossible to exercise any real control over those men whatever. Each Officer in the skirmishing line will exercise considerable influence over the men near him, but those in the rear, the Colonels and Majors and the Captains, even as long as they remain with their supports, can really do nothing to control them. If they wish any new attack made, it can only be made from the rear by fresh troops being sent up to take part in it. I am sure Colonel Hale will agree that all the works that have been written upon the subject of the late wars in Germany tell us the same thing—it was already put in the extract Colonel Blundell read—and it is this, that confusion is an inseparable part of all fighting in future, no matter how you organize your battalions or companies, or how you support them. Your first line when actively engaged will always be in a sort of chronic state of confusion, and that under the most unfavorable circumstances of noise and excitement. My idea is this, that the smaller your unit, the more easy it will be for the Captain in the skirmishing line to control it and to rally it. Colonel Clive referred a great deal to the confusion that would exist when his<sup>1</sup> reds and blues and browns got all mixed up together, but my idea is the Captain of the blues would find it much easier to rally his blues and the red Captain his reds in a line such as that if he had only to rally and collect together 50 or 60 or 70 men, instead of having to attempt to rally 200 or 250. I think when strong companies are mixed together, it would be absolutely impossible during a partial lull in the engagement to attempt to rally your company, and we all know in that critical moment that takes place in every successful action—the moment you have driven your enemy off, or seized his position—the absolute necessity there is at once to collect your companies together. Picture to yourselves the confusion that exists then, and you will see how much more easy it would be to rally a small company than it would be a large one.

Colonel Clive referred to the remarks I made in a previous lecture upon this subject, and he quoted what I had said so very correctly that I shall not recapitulate it. I will only add that if when in command of 100 men in action, I found the impossibility of controlling them when in skirmishing order, and that if during the progress of an action when both sides were armed with muzzle-loaders, I upon several occasions lost sight of a large proportion of my men, sometimes for hours together, picture to yourselves what my position would have been if my company had consisted of 250, instead of 100. What command should I have had over 250 men? I flattered myself then, as every Captain does, that I was able to impart some of my spirit into those I commanded, but I should like to know how you could do that if your line is extended over the distance 250 men would occupy in skirmishing order? I look upon it as an utter impossibility. Colonel Clive made a remark that I must say I do not agree with. Almost the last remark he made before he sat down was that we ought rather to apply our system of organization to suit great Continental wars that may possibly be forced upon us once during a century, in preference to suiting our organization to the small wars that we have, not once a century, but I may say almost every succeeding year as it passes by. We know that as a nation

<sup>1</sup> Referring to coloured diagrams of companies moving up as supports, reserves, &c.



we are the only one that is really always at war. I do not think there is ever a year in which there is not some small colonial war going on—some Abyssinian or Ashantee, or some other small expedition; we are fighting the Jowakis in the north of India, or we are preparing to fight the Chinese; there is always some small warfare going on in our very extensive Empire. I therefore differ entirely from Colonel Clive's views on this point, for I think we ought to make our organization and our system of drill to suit the warfare that is in fact our normal condition of existence, and not the abnormal wars that perhaps once or twice in a century may be forced upon us. I think if any gentleman here who has taken part in many of our small wars will think over his experiences in them, and if he will consider what the effect upon himself would have been, how he would have managed if his company had been 250 men, or how the system would have worked at all if every company in the army operating during those small wars had consisted of 250 men, I am inclined to believe he will lean to my opinion. Take India for instance, a country where we are continually fighting. A very common brigade in India is one European regiment and two, three, or four battalions of native infantry, perhaps artillery and cavalry. Without saying anything to depreciate the native troops, we all know the backbone of that force is the battalion of white troops—they are the point of the sword. You wish to detach a small part of your European force as an advanced or rear-guard. You have only four companies in your battalion, and you have consequently to send a company; you lose one-fourth of the troops upon whom of course you rely most. The next detachment takes another fourth, and you are left with only half the battalion. If you think of that result you will concur with me in saying that eight companies of about 100, or 80, or 70 men is a far more convenient establishment for troops engaged in a small war, where the brigade consists of one battalion of white troops and three or four of natives. Take for instance outpost duty; how very inconvenient with only one battalion of white troops it would be if obliged to furnish outposts from it for such a force. If, as I believe, our present organization is more suited to small wars and bush-fighting, than the organization which has been advocated by Colonel Clive, I would wish to ask, is it not much better suited also to our Reserve Forces? This is a point that has not, I am sorry to say, been referred to by any one during the discussion. How about applying this strong company system to our Militia and Volunteers? I think it will be generally recognised as an axiom that it is absolutely necessary, whatever system of organization you have, that it must be one you can apply to all your military forces throughout the world. I do not wish to say anything derogatory to the Reserve Forces. I had the honour of being connected with them for several years, and I know all that can be urged against them; but remember how very small the opportunities are which a Captain of Volunteers or Militia has for learning his work. I very much doubt if there are very many young Captains in the British Army who could effectually command 250 men, but hand over 250 men to a man who only serves 28 days in the year, or to a Captain of Volunteers, who perhaps only attends parade once a week, how is it possible for him to acquire the method and manner of command that is necessary for the command of 250 men. I do not think it would be possible. As I read the history of the great wars that have recently taken place in Europe, and I have done so with very great care, as I know Colonel Clive and many of those I see here have done also,—as I read those narratives I confess I cannot find in any part of them any evidence that the introduction of breech-loading arms necessitates this system of strong companies, and when I remember what has taken place in those various conflicts as I read of them—I had not the advantage of seeing them—and try to evolve from my brain what I think would be the best system of organization for our own Army, I feel, I am bound to say, that the present system of our own organization appears to me to be infinitely preferable to that which has been advocated so ably by many here to-day, and notably by my friend, Colonel Clive. I believe, gentlemen, that not only would it be, as I think, impolitic and wrong to adopt the strong company system in our Army as the system of organization, but remembering the varied conditions under which we serve, and the varied composition of our Army, consisting as it does not only of regular troops, but of Militia and Volunteers in this country and in every colony all over the world; that it consists of West Indian troops and also of that large and magnificent army in India, raised from the

various fighting races, an army which I am glad to say is now disposable for service in all parts of the world ; when you remember this complex nature of our Army, and the varied material of which it is composed, I believe it would be not only unadvisable to adopt this four-company system, but even if that system were recognized as the best one, it would be utterly impossible and impracticable to do so.

I am much obliged to you for listening to what I have said. I have now only to add that I am sure you all agree with me in thanking Colonel Clive for his very valuable lecture, and also in thanking those gentlemen who have taken part in this discussion, and whose able speeches have added to the interest and the value of our proceedings to-day.

# Evening Meeting.

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Monday, 18th March, 1878.

REAR-ADMIRAL JASPER H. SELWYN in the Chair.

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## THE BEST METHOD OF CARRYING LIFE-SAVING APPARATUS ON BOARD OUR MEN-OF-WAR.

By Commander A. H. GILMORE, R.N.

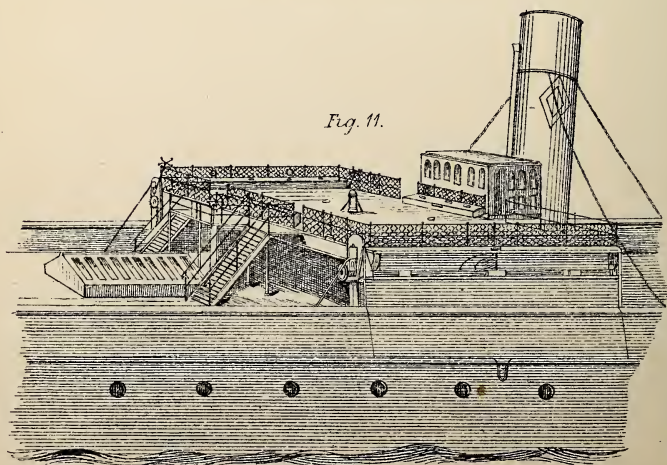
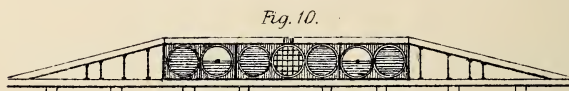
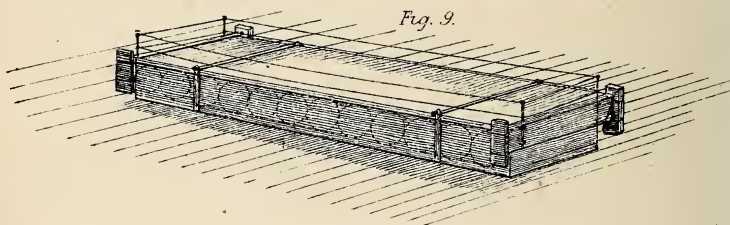
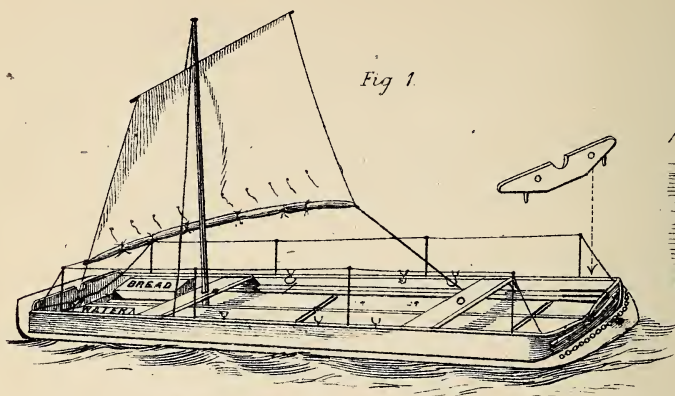
THE subject of the paper which I am about to have the pleasure of reading to you, although embracing the vast issues of life and death, is, at the same time, so simple, that, whilst I hope to enlist your sympathies, I shall not trench long upon your time in reading it. The question affects directly those who go down to sea in what we are pleased to call ships; though what our ancestors would have designated them, I am at a loss to say. Well, these ships, although they, like the old men-at-arms, armed *cap-à-pie*, possess all the elements for destruction, also, like the men-at-arms unhorsed, are equally helpless when disabled, and are completely at the mercy of the light troops. Indeed, when not disabled they may receive a vital wound between the joints of their armour. In the prize-ring it was considered cowardly to hit below the belt, as the blow would be dangerous, and the pugilist dealing the blow lost the fight; in naval warfare the exact reverse is the case—the great aim and object is to strike below the belt and win the fight. A man struck below the belt could be carried out of the ring by his backers; a ship struck below the belt has but the resources of the ship for its crew to depend upon, for their safety. As I said before, the question touches immediately the crews of our ships; it also touches the relations and friends of these men and the country to which these trained men belong.

Although warfare has become so much more deadly of late years, our means of saving life are no greater (if so great) as they were some years ago. It was very rare in the old days of our wooden walls for a ship to go down in action, and I don't think there is a case on record of both combatants being sunk at the same time, the survivor was thus able to save the crew of its beaten foe; besides that, the floating *débris* was left for the men to cling to.

Very different are the conditions of warfare now-a-days; it will only be by possessing the greatest skill, seamanship, nerve and pluck (all of which I believe our seamen possess to a greater extent than the sailors of other nations), that a ship can hope to escape an action in which shot, ram, and torpedo are all brought into play, the injury



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*Raft shown in position as a Captain's Bridge.*

inflicted by two of which might cause instant destruction. Of the two, I should prefer to be sunk by a ram, as it might remain to pick one up, although it is quite possible, that whilst effecting my destruction I might in the death-struggle give the ram its *coup de grâce*. Well, to save the crews of our vessels we have the usual ships' boats; but the larger of the boats will be lumbered up with engines and torpedo-gear, besides the chance that before the fatal moment came, when they would be wanted to save life, they may themselves have succumbed during the dangerous experiences which they are called upon to go through now, both at picket or on aggressive work as torpedo boats. Truth is, that the inventive mind has been so busy of late in devising the best (by best, one of course means the worst) and surest means of destroying life, that there has been no time nor energy left, to contrive how best to save life. How to burn, sink, and destroy has occupied too much time to allow leisure to look at the reverse of the picture. In our old paintings of sea fights, we see boats rowing about picking up the crews of sinking ships; in the Russo-Turkish war, however, in the few cases in which the Russians destroyed Turkish ships, the opposite has been the case; the Russians have been unable to save the Turkish crews. Of course the most strenuous efforts were made to save their enemies' lives, but, alas! without success! The fact remains, however, that the Turkish ships not being supplied with any ready means of saving life went down, and their crews went with them. What I propose, and what I wish discussed is, the best method of supplementing our boats with life-saving apparatus; I don't mean simply apparatus to support a man for an hour or two. Admiral Ryder and other gentlemen have suggested such means; but what I should like to see supplied to our ships is such equipment, in the shape of rafts,<sup>1</sup> as would suffice to carry their crews, and at the same time carry the necessary amount of subsistence to support the rescued men for a short time. We have read in history how hastily constructed rafts have been the means of carrying shipwrecked crews across large tracts of ocean, the men eventually being saved. We judge then what properly-constructed and well-supplied rafts might do on emergency.

I have examined the models of several of our ships to ascertain their capacity for carrying rafts without materially interfering with their efficiency. I find that the "Rupert" could carry a raft abaft the mainmast, and the "Wivern" rafts on poop, forecastle, and amidships. I would propose that vessels possessing poops and forecastles should have rafts on the top of them, constructed of air-tight cells or of cork-compartments, forming "flying" poops and forecastles. Vessels of the "Prince Consort" class could carry rafts in many places. "Achilles" and "Agincourt" the same; "Monarch" on the fore-castle, and from after-turret aft. The "Devastation" class could have the hurricane deck divided into rafts. The "Invincible" class can carry rafts upon the upper deck; in fact I don't think that there is one vessel in the Navy in which some place cannot be found available for the purpose. Our broadside ships might, also, carry boats, on

<sup>1</sup> The lecturer here showed a model of a raft (see Figs. 9 and 10), and also of another composed of mattresses attached by a framework of wood.



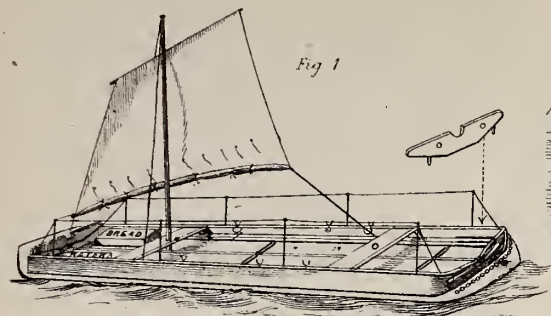


Fig. 1

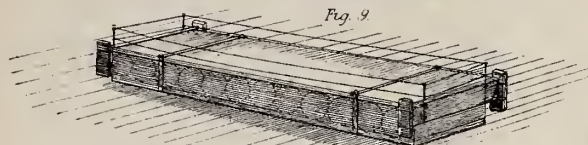


Fig. 9



Fig. 10.

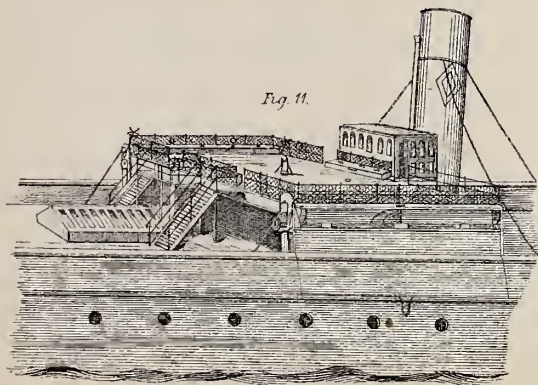


Fig. 11.

Raft shown in position as a Captain's Bridge.

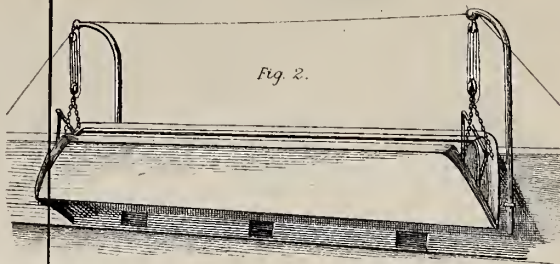


Fig. 2.

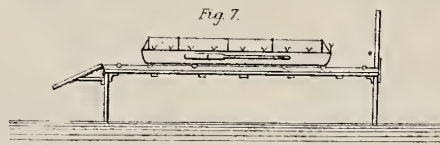


Fig. 7.

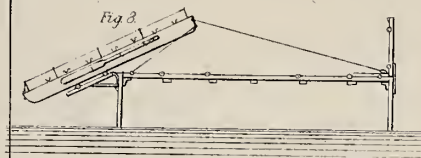


Fig. 8

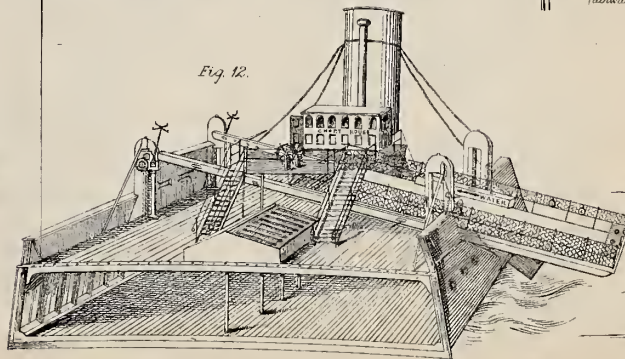
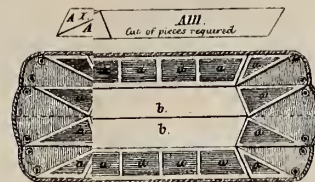


Fig. 12.

Raft in process of being launched.



a. a. a. Fig. 3. b. b. Spanish Lane.



Fig. 6.

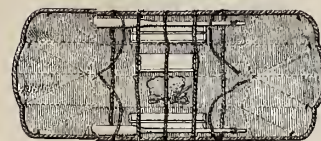


Fig. 5.  
Brailing the ropes the canoe is  
made as seen in Fig. 4.

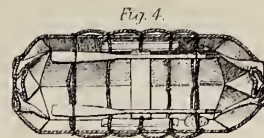


Fig. 4.



Fig. 17.

Midship section of Double Cylinder Boat,  
with Air tubes



Fig. 16

Midship section of Launching Platform  
or Raft carried on Pontons

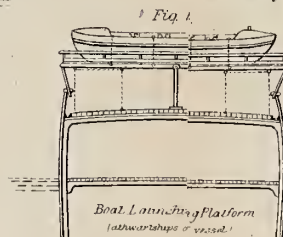


Fig. 1.

Boat Launching Platform  
(athwartships & vertical)

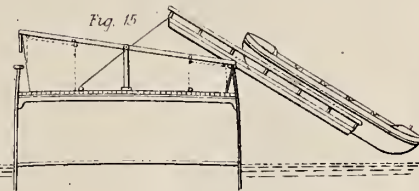


Fig. 15

Launching Platform discharging Boat into the Water.

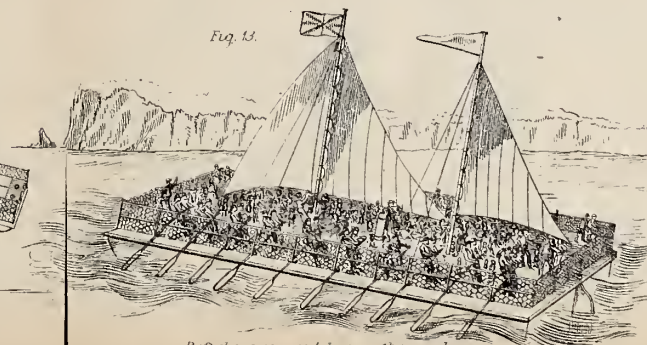


Fig. 13.

Raft shown equipped, leaving the wreck.

inflicted by two of which might cause instant destruction. Of the two, I should prefer to be sunk by a ram, as it might remain to pick one up, although it is quite possible, that whilst effecting my destruction I might in the death-struggle give the ram its *coup de grâce*. Well, to save the crews of our vessels we have the usual ships' boats; but the larger of the boats will be lumbered up with engines and torpedo-gear, besides the chance that before the fatal moment came, when they would be wanted to save life, they may themselves have succumbed during the dangerous experiences which they are called upon to go through now, both at picket or on aggressive work as torpedo boats. Truth is, that the inventive mind has been so busy of late in devising the best (by best, one of course means the worst) and surest means of destroying life, that there has been no time nor energy left, to contrive how best to save life. How to burn, sink, and destroy has occupied too much time to allow leisure to look at the reverse of the picture. In our old paintings of sea fights, we see boats rowing about picking up the crews of sinking ships; in the Russo-Turkish war, however, in the few cases in which the Russians destroyed Turkish ships, the opposite has been the case; the Russians have been unable to save the Turkish crews. Of course the most strenuous efforts were made to save their enemies' lives, but, alas! without success! The fact remains, however, that the Turkish ships not being supplied with any ready means of saving life went down, and their crews went with them. What I propose, and what I wish discussed is, the best method of supplementing our boats with life-saving apparatus; I don't mean simply apparatus to support a man for an hour or two. Admiral Ryder and other gentlemen have suggested such means; but what I should like to see supplied to our ships is such equipment, in the shape of rafts,<sup>1</sup> as would suffice to carry their crews, and at the same time carry the necessary amount of subsistence to support the rescued men for a short time. We have read in history how hastily constructed rafts have been the means of carrying shipwrecked crews across large tracts of ocean, the men eventually being saved. We judge then what properly-constructed and well-supplied rafts might do on emergency.

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falling-out davits, similar to the paddle-box boats of old. I would also suggest that boats be supplied in frame which might easily supply the place of any that may be lost.

The only vessels carrying extra boats are the troopers, and they have Berthon's collapsable boats, which hang up like barn doors against the ship's sides, and which would speedily be riddled. As it is still contrary to the usages of war (strange as it may seem) to use explosive bullets, might not some arrangement be come to as to the employment of torpedoes, say—I know the idea is Quixotic—to limit their use to within a certain distance from the land? The people on board St. Paul's ship, on broken spars and fragments of the wreck, all got safe to land; but in this 19th century many of our ships don't carry spars, and as the fragments of the others would not float, it behoves us to have some part or parts of the wreck capable of floating. There is no doubt that our seamen and marines would go into action with the same pluck, energy and devotion as heretofore; but they would have more confidence if they knew that, if, through the fortunes of war their ship was to sink, they at any rate had a chance of being saved.

I must apologise for trespassing so long upon your time, but the question is a most important one, and I trust that the discussion this evening may be fruitful of good results. Of course the putting of rafts on the decks of ships and on their poops and forecastles would be rather cumbersome, and would add something to their top weight; but I defy anyone to spoil the beauty or add to the ugliness of our ironclads, and I should hope that our naval architects are capable of making such an arrangement of the weights as will allow of these superstructures being carried. As it is a question that comes more home to the seaman, and on which he is as well capable of judging as the ship-builder, it is to be hoped that our naval Officers will be consulted on the matter. Perhaps it is not too much to hope that the Lords of the Admiralty may appoint a Committee to inquire into the feasibility of our ships carrying either the life-saving gear I propose, or some better means for rescuing the crews of our ships.

The CHAIRMAN: I have now to invite discussion upon this subject, which is a very wide one, and likely to be a very interesting one. If gentlemen would only keep in mind that our ironclads are, as has been said, much more likely to hurt each other during an action, as we have seen in the case of the "Vanguard," than they ever were before, it will be seen how necessary it is to provide means for saving the lives of our men. We have provided many means of offence, but we have hitherto failed in providing any means of defence under water. . . This raft (Fig. 11) is a means at least of mitigating the enormous loss of human life which we might otherwise have to regret.

Commander GILMORE: I may state that Sir William Mends, at the head of the Transport Department, has a pontoon raft formed from the pontoons carried by large vessels, but it is not a ready means of safety. I think I may call upon Mr. Roper to explain his apparatus; it is a most ingenious invention.

Mr. ROPER: I was not under the impression that I should have to explain the raft to-night. This raft (Plate XVII, Figs. 11, 12, 13) takes up the position that an ordinary captain's bridge would occupy in a merchant ship. Instead of having a deck only for the captain to stand upon, I put a floating power under, on the cellular principle, either with a flat bottom, a corrugated bottom, or a round one, as shown in these models, subdivided into lengths as a protection against foundering. This does not in-



terfere with my floating power at all. The raft carries the necessary provisions, water, signals, stores, masts, compass, and everything that is required, all above water. In time of emergency the contrivances are so arranged that there is nothing to look for; there are no lashings to cut away, but the raft can be immediately launched. The weight of the raft is four tons; its length is 40 feet beam, 20 feet fore and aft, and it will take about 58 tons to sink it. The cost would not be more than 240*l.* or 250*l.* We come much lighter and much cheaper than ordinary boats. We have two rather strong forgings which keep the raft in its position, and by throwing down a lever we let go a tumbler, similar to letting go an anchor from a cathead. The raft would fall by its own weight, and you lower it down by any tackle or by any simple arrangement on either side of the ship. The system of launching Mr. White's boat is a plan of my own. It is Mr. White's boat, but it is my system of launching, given to Mr. White about fourteen years ago by Captain Hurst through myself.

The CHAIRMAN: The weight of the raft, you say, is 4 tons? What water would she draw?

Mr. ROPER: Seven inches light; and loaded it would take about 58 tons to sink it; it would carry about 400 men with the load on board; the draught is about 2 feet. It would leave about 1 foot freeboard. The cubical contents are 2,400 cubic feet, and the thickness of the material used one-sixteenth of an inch, steel or iron. A raft of this kind, fitted on a large man-of-war, of 60 feet beam, and 30 feet fore and aft, would carry something like 900 or 1,000 men. I have here a model of a raft, built on the corrugated principle, that will carry two 16-lb. field pieces and 12 horses, and about 150 men.

The CHAIRMAN: Is that model to scale?

Mr. ROPER: Yes; and it is built on the fluted-bottom system.

The CHAIRMAN: You trust to the fluted bottom largely for strength?

Mr. ROPER: Yes; and for a passenger ship, where she would not be likely to be picked up immediately, and you might have to navigate the raft, it would keep better to windward, either upon this principle or the tubular principle, than upon the flat-bottom system. The whole depth of the raft is 3 feet, but 3 or 4 inches additional, or perhaps 6 inches, could be added, or it might be made less than 3 feet deep, according to the size of the ship. My raft could be lowered on the deck of a war ship in action and shielded behind armour, and the cells could be filled with cork to stop rifle bullets, which is a part of my patent, and if half the cells were destroyed, it would carry all the people that could get on it; the flying and ordinary decks of war ships also could be built upon my system.

Admiral RYDER: I should like, Mr. Chairman, to ask whether, considering the importance of the subject and the very short notice naval Officers have had, you would entertain the idea of continuing the discussion to-night under the understanding that there will be an adjourned discussion later in the season. If that was an understood thing it would shape the remarks of some Officers here who might like to wait until that adjourned discussion or might prefer to deliver themselves to-night. I ask you whether, considering the importance of the subject and the short notice that has been given, it would be possible to have an adjourned discussion.

The CHAIRMAN: That must be a question for the Council, it can scarcely be decided now. I shall feel it my duty to put the case before them as you have said. For the present I think we may go on with the discussion.

Admiral RYDER: The question is a very important one; as you stated, it is a very large question, and divides itself into many branches. Commander Gilmore has particularly devoted himself to one branch of it—viz., the *larger* question of the raft, which is a very important one in itself. Various descriptions of rafts have been proposed from time to time by different persons who have thought the subject well out, but besides that, there is the subject to which I have paid particular attention, namely, the *smaller* question as you may perhaps call it, but it is the one which has been thrust upon our notice during the last few years by two or three losses that we have experienced. One was the case of the "Bombay;" that ship was destroyed by fire, and when they came to muster all hands after she was burnt, they found nearly all the Marines and a large number of boys were drowned. Captain Wilson, now commanding the "Thunderer," was the commander of the "Bombay," and I

communicated with him on this subject years ago before I went to China; he gave me full permission to use his name, and I have no doubt he would do it now if I had had the opportunity of writing to him on the subject. His statement to me was this, that if the hammocks of the "Bombay" had been buoyant, no life need have been lost. That is a simple way of putting it. Just picture to yourself what it means. We all know as seamen where the hammocks are stowed in a ship; they are not down below, they are not secured, so that there is no difficulty in getting at them; they are in the nettings and perfectly handy, and though perhaps every man might not be able to get his own hammock, still if there are 400 men and 400 hammocks, it does not much matter whether a man gets his own or not, so long as the hammock itself is buoyant. Now picture to yourselves the loss of the "Vanguard." The weather is fine; she is run into by the "Iron Duke," and sank in little more than an hour. Fortunately, as I say, the weather was fine; fortunately the ship that ran into her stuck close to her, and the men were able to be saved in the ordinary way by boats. But if it had not been so, if there had been a sea running and she had sunk more quickly than she did, there would have been a great difficulty in getting the boats out, for there is much greater difficulty than there used to be in getting boats out that are stowed amidships, a fact which is familiar to all those who have been in our ironclads lately. Picture to yourselves the loss of life that might have been incurred owing to the absence of any means provided at present for saving the lives of the men if the boats cannot be got at. Buoyant hammocks in such a case would do this; they would not do a great deal for you, but they would do this, viz., enable the men to float in the water for perhaps a few hours—if there is much sea running, then for nothing like so long a time—but long enough to be picked up by any vessel in company with them. If that could be gained, it would be a great point.

In future actions we shall have intentional collisions, and ships will sink in five or six minutes, as the "Re d'Italia" did in the action at Lissa, which sank in five minutes. There is no time to get out the boats in five minutes, but there is time for a man to fasten his hammock round him, and if the hammock is buoyant he will be floating. I hope the result of this discussion will be to press this matter on the attention of the authorities. If they like, let them have rafts fitted to ships, but at all events let us have such a simple measure as this taken of having the hammocks made buoyant. There are various ways of doing this, and it would be of course necessary to select the simplest and most economical as long as it is efficient. I investigated the matter rather closely some few years ago, and I began with it in this way. It struck me when I was second in command in the Channel Fleet, watching a particular evolution in which the two lines interlaced one with each other, and passed very close, what would happen if the man at the wheel let the helm go at a particular instant. Undoubtedly we should have had a collision; we were going at 8 knots; we should have struck one another at the rate of 16 knots, and should both have sunk, probably in ten minutes, and there would have been 1,200 men in the water. It occurred to me then that a *buoyant hammock* for each man was the only resource left to us. Commander Gilmore was pleased to say that I was the inventor of the cork mattress. I do not know that I am the inventor of anything. The cork mattress has been long known. It is used on certain lines of packets, and in America constantly. All that I had to do with it was to press upon the attention of the Admiralty the importance of making hammocks buoyant, and I suggested to their Lordships to have cork mattresses. Their Lordships allowed the Captain of the "Valorous" to try some experiments. The first thing was to make the mattress *buoyant*, and then *comfortable* for the men, for Jack likes a fairly soft mattress to lie upon; he will not put up with what the Russian is well contented with, viz., a very loose bag of ticking, in which the cork slips about from one end to the other. Our men are not content with that, and therefore the mattress had to be prepared with internal partitions to prevent the cork from slipping about. The men said they were still not comfortable enough, the mattresses were rather hard; and although the pieces of cork were very small they were not comfortable, therefore it was found necessary to put some hair on the upper part of the mattress. Of course that ran up the expense of the mattress to a certain extent. But the question reached this point, viz., that the Admiralty four years ago gave directions that 1,000

of these mattresses should be made, and that an experiment on a much larger scale should be entered upon; unfortunately, a change took place at the Admiralty, and a counter-order was given. The cork mattress was exposed to this test—I am not saying it was an improper test, but at any rate it was a peculiar one. It was ordered that a cork mattress with hair should be sunk six feet under salt water for 24 hours, to see what would happen to it. Of course it never entered my mind that it would be necessary to sink it in that way, therefore it was not an experiment I should have proposed myself. It was ordered, however, by proper authority, and tried, and then the mattress was hung up for 21 days, and a log was kept of its proceedings during that time, which were these: The weather was alternately damp and dry, and the mattress indicated different weights on different days, varying some few pounds and ounces, and at the end of the 21 days it was not dry. I do not know whether any of the gentlemen present have noticed that their sponge is not dry when it comes out of the sponge-bag in which they may have placed it, if the orifice is closed; and for the same reason it is not natural that cork should dry if left in so thick a cover as the tick of a mattress. Owing to its having been immersed in salt water it behaved very like a monkey jacket at sea after it has had a thorough drenching—it is heavier one morning than it is on another, because the salt absorbs the moisture one day and then when the day is dry the jacket becomes lighter. However, this was considered sufficient to condemn the cork mattresses, because it was supposed it would be highly inconvenient if they behaved in that way. That being the case I turned my attention to a waterproof cover for the mattress, or a waterproof sheet. It occurred to me if their Lordships would not have a cork mattress, the next best thing was to place a waterproof sheet 8 feet by 4 between the hammock and the mattress; the sheet being lashed up inside, would oppose a great deal of difficulty in the way of the hammock sinking. I tried the experiment to satisfy myself about it in this way. The hammock with the sheet in it was lashed up, and I placed it in a tank with the weight of a man under water attached to it, viz., 20 lbs., and after 48 hours I found it had not sunk, nor had the water forced its way through in any degree. Of course, in the open sea among the waves, the floating body would not be in quite so favourable a condition as it was in a tank. If the foolish man who is attached to the hammock, and wants to be sustained by it, climbs over it and forces it under water to some distance, the water may find its way ultimately in amongst the hair of the bed, and the hammock would sink. No doubt those of us who have been at sea have seen how hammocks fall overboard and float until they are lost in the distance if they are not picked up, but if there is nothing impervious in the hammock the water will gradually force its way into the hair and the hammock will ultimately sink. I know, however, by the experiments I have tried, that a waterproof sheet of sufficient size interposed between the hammock and the mattress will just enable the hammock to keep one man floating for a few hours. After that I do not think many men floating in a rough sea would have much chance of living with their bodies immersed in the water. I believe these sheets can be made of stout, strong calico for about four shillings a piece wholesale, but cheaper in the dockyards.

Captain P. H. COLOMB, R.N.: It seems to me in these matters you have first to think of general convenience. Humanity is constructed of that stuff that it will not submit to a permanent inconvenience, however good the ultimate result may be. If you propose to supply life-saving apparatus to a ship, to come into special use when that ship is sinking, you must consult the convenience of the people on board that ship, and the convenience of the purposes for which the ship is constructed. Now I own that between the question of rafts as supplied to men-of-war, and the question of an arrangement for making the hammocks buoyant, there seems to me to be a very distinct line of demarcation. It is quite certain that making the hammocks buoyant, say, by means of a waterproof sheet, is no sort of inconvenience to anybody, but, as Admiral Ryder has just pointed out, it is a very great convenience to the crews of our ships. On the other hand, it seems to me always difficult to place anything on the raft principle in such a position and under such arrangement on board our war ships as shall not cause very considerable inconvenience. The weight carried by ships of war is cut so exceedingly fine, and the position of those weights is so very accurately distributed, that even a matter of



four or five tons carried at a height above the deck, would be a consideration which would to some extent embarrass the naval architects. But on the other hand the weight involved in making the hammocks buoyant is of course not to be considered for a moment. Neither is the expense. And, speaking from the man-of-war point of view, what we really do look for is immediate safety, not that we should be able to make a voyage on a life raft after the ship is sunk, but that we should, when the ship sank under our feet, be able to save ourselves, float ourselves for the five minutes, the ten minutes, the hour, or the two or three hours that would elapse in an action before steps were taken to pick us up. There again it seems to me that the buoyant hammock is the proper plan. I have thought for some years more or less on the subject, and I find I always reverted to the buoyant hammock as being the most easily arranged and the most useful for the purposes of the war ship. For the merchant ship we have not the hammock, and there I fancy that the arrangement of the life raft comes nearer to the ideal of what would be required. There indeed the crew cannot depend upon being picked up in a matter of minutes or hours; there indeed it is necessary for them to have the means of maintaining themselves afloat for perhaps days, or it may be weeks, and therefore I think that for the merchant ship the life-raft principle is one to be aimed at, while for the man-of-war I think that the buoyant hammock is the object of our desires. But the lecturer reverted to a point which I hope may be taken into consideration, if it is adjourned to a future occasion, that is, to the question whether the modern system of warfare which strikes a man "below the belt" is a fair system. I cannot help observing here and there in different quarters, a feeling growing up that the employment of arrangements for sinking and destroying ships is after all very similar to the arrangement for using explosive bullets. In former days you made an attack upon a ship in her port, you boarded her, "cut her out," and you brought away a prize without injuring human life more than was absolutely necessary to take possession of the ship. Now, on a dark night, with disguised language, and disguised dresses, you sneak out alongside the war ship. You pretend to be that which you are not, and you explode certain kegs of powder under her bottom, and you send her and all on board to the bottom; and then you think you have done an exceedingly valiant action. I own that I hope the time will soon arrive when some international arrangement may be come to limiting the use of weapons which destroy life without gaining anything like commensurate advantages, for I am quite certain the combatant who goes in, cuts the ship out, takes her away and maintains possession of her, does very much more for the country he serves than that combatant who goes and simply sinks her and destroys the lives of those on board.

Admiral R. V. HAMILTON: I was in hopes we might have heard some one in the Merchant Service speak on this subject, for it is certainly one of great importance to them. For my own part I must say I quite agree with the lecturer on the main subject which he has brought before us, however I differ from him on one or two points. And first in his attack upon the beauty of our ironclads, for that is a point upon which, having commanded the "Achilles" for three years, I differ, having always thought her a very handsome ship; to revert to the main point, however, she carried 700 men, and her boats only held 250, therefore it is very certain that those boats ought to have been supplemented by something in the way of rafts. No doubt ships ought to have some additional means of saving life, and so far as I have heard, I certainly agree with the hammock system as being almost the only one applicable for men-of-war. There is also another advantage resulting from the use of the waterproof sheet, for we all know the unpleasant result of having a hammock saturated with salt water, so that being covered with this waterproof sheet, the comfort of the men would be greatly increased, as the bedding could not be wet. All the Cunard steamers carry life-buoys according to the number of passengers. On one occasion I remember the "Africa" getting ashore on the coast of Newfoundland, and they were afraid she would go down, and such was the excellent organization on the ship, that every passenger had his life-buoy. There was one man in such a state of panic, that he put his life-buoy on feet foremost, so that if he had gone overboard, he would simply have floated head downwards. It is only by good organization in the hour of safety that you can meet the demands of the time of sudden emergency. I have seen two

wrecks in my life; I never wish to see another. In the one case the ship went to pieces in five minutes, and every soul was drowned. The other case was near Portland in the month of November. A large ship came on shore at half-past five in the evening; it was pitch dark, and blowing a heavy gale, but owing to the organization of the Coastguard, and the way the rockets were got on board, by half-past seven that evening 62 lives were saved, owing also to our having by great good luck a very large supply of blue lights and tar barrels on shore.

Admiral RYDER: Commander Gilmore spoke of making a raft of mattresses. The cork mattress will only float 60 lbs. weight, that is, three men in the water with their shoulders just awash. By his raft of mattresses to support the whole crew he of course means to have the men *on* the mattresses, so that taking a small man to weigh, say, 120 lbs., it would require two mattresses to support him out of the water, although one mattress will support three men in the water—this has often been overlooked. Rafts of mattresses would be out of the question if there is only one mattress to each man.

Rev. JOHN GILMORE: Although a clergyman, I was during a long period in a position which gave me a special interest in the question of life-saving at sea. For many years I was stationed at Ramsgate, and was very much interested in the life-boat work that went on in that port, and have thought much and long and patiently over the various considerations suggested by that most important question of life-saving at sea. With reference to the subject of the lecture, I cannot help thinking that we are, as a nation, very apt to be content to live in a "Fool's Paradise," to forget some part of our duty, to ignore some evident danger, and we require to be aroused from our apathy by some great and sudden calamity,<sup>1</sup> and then alone do we realise how foolish we have been to have remained in such circumstances so long. Every imaginable appliance that ingenuity can suggest or money provide, has been suggested and provided for the sake of the destruction of our enemies, but what means have we taken in proportion with reference to the saving of our friends? Undoubtedly we must feel that as we hope our extensive armaments are sufficient to destroy the ships and lives of opposing foes, so we must not forget that the armaments of those opposing foes are also sufficient to sink our ships, and to destroy the lives of our friends. In this possibility have we attempted any large organization to meet such a contingency? We must say, we have not. I cannot but conceive that both the suggestions made by the lecturer and by Admiral Ryder are essentially necessary. We shall require means for ensuring safety for the individual during moments of immersion, and also means for the safety of the many during a possible long period of exposure in the sea. It seems, perhaps, almost impertinence on my part to suggest it, but I think if this waterproof sheet as shown us were supplemented by a purse at either end, into which the ends of the hammock could be inserted, it would enable the hammock to be wrapped up much more easily, and so protect it from the water, and it would also have its uses on shore. I think the suggestions made by Admiral Ryder are very valuable. I was very much interested some years ago when my attention was first drawn to the raft suggested by Mr. Roper; really one almost feels inclined to think that the great reason why all these means of life-saving have not long since been provided, is this fact, that a man can only be drowned once; and sailors are tempted as it were to take their chance of this once. If it were possible for a man to be drowned some twelve times, after the tenth time or so he might perhaps become urgent for the providing of some means of safety in the case of fresh danger for saving himself. But, seriously, it is not the sailors, who run the risk of being drowned, who have the organization of these matters on shore. We on shore should see to it that twelve men shall not be drowned if we can help it, although one man cannot be drowned twelve times. Speaking as one associated with the sea and seafaring men all my lifetime, and expressing the spirit and feeling of, I most fully believe, the country at large in its love for the Navy and sailors, I do believe any amount of reasonable or even unreasonable expenditure would be popular with the nation, that would give people

<sup>1</sup> Since this discussion took place, the dreadful loss of life by the foundering of the "Princess Alice" on the Thames has occurred. It is to be hoped that *public* attention will now be fully given to this most important question.—Ed.

the idea that our fleets are provided with that machinery which shall be the cause of safety in the possible contingency of a ship being struck by a torpedo, or by the huge shots that are now prepared to be fired at them. Mr. Roper's raft is in all its ingenuity absolutely a ship in itself—an empire within an empire. It is easy of construction, and although an objection has been suggested as to the top-hamper of its weight on deck, yet true philosophy knows this well and always seeks to act upon it, namely, that in almost all cases in life, there is no such thing as a perfect good. We have to weigh possible evil against possible good, and I cannot help thinking, considering the immense weight of our vessels, that the centre of gravity would not be elevated to a very disproportionate extent by a top-hamper of four or five tons, and that that could not be a strong argument against the expediency of some such plan as that which Mr. Roper proposes. I imagine the lecturer has suggested his own raft as a modification of that plan, where the bridge-raft of Mr. Roper cannot be accepted, and as something to place at any part of the ship on account of its greater simplicity. With reference to the hammock and waterproof sheet scheme, I would ask why should not it at all events be carried out? Supposing we had to have the horsehair mattress instead of the cork, the hair mattress in the hammock would itself have an immense power of buoyancy. If the water were kept away, it would be nearly as efficient as the cork, and by means of this waterproof sheeting the water can be kept out. I must apologise for obtruding my opinions upon this meeting, but the deep interest I take in everything connected with our seamen must be held as my excuse.

Captain LINDESAY BRINE, R.N.: In lieu of a raft of this description (Roper's) I think that it would be more useful to try a system which would answer two or three purposes; and I would ask why should not the bridge on board most vessels of war be so fitted as under certain conditions to be able to be used as an ordinary boat for landing or embarking troops, or for the ship's own purposes. It seems to me that this plan of Mr. Roper's is more fitted for merchant ships. If the weight is an objection, there is no reason why it should not be made half the size; and it will then still be able to carry a large number of men. I should like to ask what objection, beyond that stated by Admiral Ryder, has been made to the principle of the waterproof hammock? No doubt the lecturer's attention has been turned to all these points, and perhaps he can give us some information.

Commander GURDON: I should like to ask one question. Has Commander Gilmore considered what will be the effect of artillery fire upon these rafts? At the present day you find that your boats are absolutely riddled in five minutes. In the action between the "Shah" and the "Huascar," the Peruvian ram's boats and all her rigging were cut to pieces in five minutes. Have you calculated the effect of artillery fire on the rafts? <sup>1</sup>

THE CHAIRMAN: The shortness of the notice has prevented the presence of many who take an interest in this subject; but before we close I should like, in a few words, to strengthen what has been said rather than to criticise. There are, indubitably, at present objections to the carrying of any more very heavy weights above, in a man-of-war. When you come to understand that some of our finest ships have a margin of safety which might be reduced to 17 degrees of heel and is at best ranging between 30 and 40, and that these proposed additional heavy weights are at the extremity of the lever, if carried so high up, one can easily see why for men-of-war as at present designed, the question of carrying more weights highly placed, is one which naval architects watch with the most jealous care. I hope to see turrets abandoned sooner or later in favour of guns carried lower down, and then possibly we may attend more to the life-saving question; but at present we can scarcely do it

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<sup>1</sup> I fear that the concussion from the heavy guns carried in turret ships is so great, that any raft or boats carried, as Commander Gilmore proposes, would be speedily rendered unseaworthy; and in sparred vessels it is *absolutely necessary* to keep the decks clear to work the ropes and spars. The only solution of the difficulty that I see, is to carry boats of prepared canvas in frame, that would fold up like a crinoline, taking up no room, with rowlocks of wood fitted in, shoes of wood at stem and stern ready to fit in stem and stern posts, and a fitted kelson of wood in sections.—T.P.G.



in this manner. In a naval action, just at the time when it might be hoped that contrivances such as those brought before us could contribute most to the saving of life, it would be found that they were extremely open to any mitraille or shell fire and probably would be rendered useless long before the ship herself was sunk. But with regard to our passenger steamers, few people understand what is the discrepancy between the requirements of the Board of Trade and actual practice. I have been across the Atlantic several times in 6,000-ton vessels, carrying actually from 1,500 to 2,000 passengers, capable of carrying with ease 3,000 passengers. There were probably boats on board, in case anything happened to the ship, which would have carried from 200 to 300 passengers, supposing all those boats had been got into the water without damage (which is a thing you can scarcely expect from an undisciplined crew and still less disciplined passengers), and supposing that every precaution had been taken. Is it not then time for the British public, which travels so much by sea, to turn its eyes to the possibility of making the very unsightly structures which compose the upper decks and bridges of modern large steamships available for a purpose so useful as that of this raft? In order that this should be done, a great many persons have devised different species of rafts to be put together in case of necessity. I need not say that the bridge-raft supersedes all these in its immediate applicability,—that it is capable of carrying provisions and water, and many other things which must not be wetted. It may indeed be used as a bridge; but it is fitted really for the purpose of life-saving, and is in a place where it can easily be got at if the ship should go down even very suddenly. It has in principle great advantages for that purpose, and I hope to see it closely studied and very largely adopted. As to our men-of-war we must take our service in the Navy with the understanding that a great many more risks are to be run by everybody embarking on board the man-of-war than was formerly the case. We are quite content to run those risks, and we ask for nothing else in the Navy, but to be allowed to make them (what the naval architect does not always make them)—seaworthy; to make them capable of being fought with the least possible risk, which the naval architect does not always understand; and to make, also, a possibility of saving as much life as possible when the ship herself is destroyed. Those are the conditions we ask to be allowed to fulfil; and when naval Officers of high rank come forward with ideas such as these of buoyant hammocks, or any other form by which life may be saved, and certain disabilities may be met by seamen, I think it should receive not only the appreciation of the authorities, but also the appreciation of the British public. Unless the nation demand that their seamen shall be protected, it is hopeless to expect that the subject will be attended to. So soon as the British public takes a question up, it is attended to in the House of Commons, and the House of Commons makes it necessary for the authorities to attend to it closely also. The spirit of resistance to the introduction of new inventions is not an unnatural one. It arises simply from the fact that no man in the position of a high official can possibly attend to these things, and the British public can only do good by inducing the formation of scientific bodies of men to whom the authorities can go with confidence for the appreciation they have not themselves the time to give. An Institution such as this does a great deal of good in this way. It brings together a great number of conflicting opinions; it gives everybody an opportunity, whether a civilian or a professional man, of having his ideas discussed; and we hope it may be of increasing utility to the public services in that way. I should be glad to see more attention paid by professional men to these lectures; but when you ask a man, after eight or nine hours of office work to come here and sacrifice his evening, you ask him for a great deal more than most men are willing to give. With regard to what has been said about the double use of the waterproof sheet, no more fatal enemy has ever been met by the British soldier or sailor than disease. The bullet does not kill in any war, one-tenth of the number of those who are killed by disease. It has been found that sleeping at night on the ground is productive of the beginning of almost all those diseases; and if by having this arrangement for the hammocks at sea you can save life in the case of disaster, and provide not only for our sailors, but also for their comrades in the army who are disembarked in larger numbers, a protection against the seeds of disease on shore, and so prevent a diminution of the lamentably small number which we reckon as our

active forces, we shall have done a great thing for the public service. No words of mine can overrate the importance of the attention which must be given to this subject, whether it be in the shape of hammocks for men-of-war, or rafts for our merchant steamers. We have arrived at a time in the history of the world in which many go to and fro, and knowledge of these points certainly ought to be correspondingly increased.

Commander GILMORE: I am much obliged to you for your kind attention. I call my paper particularly "The best method of carrying Life-Saving Apparatus on board our Men-of-War." Of course anything that would tend to save life on board a man-of-war would equally tend to save life on board a merchant ship. Admiral Ryder alluded to the difficulty of getting out boats in these very long ships. A vessel has to get her boat out by tackle from mast to mast, 150 feet distant, and the strain on the tackle is very great. My proposition obviates that: I also propose that the beam boats shall come down under cover, and be protected. There would be no difficulty in putting on tackles; the tackle can always be hooked on, and the boats ready for being turned out. The question of the constructor not being able to add a few pounds to the upper deck of our large ships seems rather a curious one. The difference of the weight of one iron plate would make all the allowance necessary for Mr. Roper's raft, and you might taper some of the iron plates off or remove one if there was any necessity, and so make allowance for the increased weight. My raft, as Captain Colomb said, is a supplementary one to Mr. Roper's. It was not intended to be carried on the bridge, but in such parts about the ship's deck as may be found convenient. This raft would lie between two skylights and the bulwark; it would be plated so as to protect it from mitraille, and the cylinders would be packed with cork, which if perforated would not seriously injure the structure. (Figs. 7, 9, 10.)

There cannot be the least doubt in the world as to the great value of the hammock as proposed by Admiral Ryder. It is very well for a man to float about for two or three hours if there is a chance of being rescued at the end of that time, but in the case of a naval action, it would very likely be the case of Kilkenny cats over again, and no friends or enemies might be left to pick them up, and it would be almost charitable to let him put his hands above his head and go down at once rather than for him to be floating about for two or three hours with the certainty of sinking at the end. The raft must come into play if you want to save many men. If a vessel is at hand to pick up the men, well and good, if not, you can at very small expense and without very great inconvenience, have the means of saving your crews.

Mr. White's boats are something on the principle of Mr. Roper's, who told you that he was the introducer of the principle to Mr. White. Mr. White's boats are on the bridge and are launched from the bridge, but they have no other advantage over any ordinary boats. In the case of a merchant vessel, even if it had all the possible boats, the rush of passengers in nearly every case causes the loss of several of them; but it is impossible, however much they rush on to a raft, to sink it or capsize it. The raft cannot be capsized by any action of the waves; it would be driven by the waves along the surface of the water without any chance of being turned over.

Mr. ROPER: With regard to lowering the raft, my raft can be lowered down within the iron plating on to the deck, and elevated again for launching, or it can be lowered on deck and launched as the ship rolls. About the top-hamper, I think we should come much lighter and much cheaper if you would dispense with half the boats. If you were to adopt the hammock principle you would come much heavier.

Commander GILMORE: Hammocks must be carried.

Mr. ROPER: But then the waterproof sheeting, and the cork for 400 hammocks, would come to five tons.

Admiral RYDER: I was not speaking of cork, I proposed the sheeting, which weighs 4 lbs., or 500 will weigh 2,000 lbs.

Mr. ROPER: But your sheet won't float you.

Admiral RYDER: The mattress in a waterproof bag, or in a sheet, and so long as it remains impervious, will float six men.

Mr. ROPER: A cork mattress?

Admiral RYDER: No, no cork at all, a hair mattress; the buoyancy of a hair mattress, if made impervious to water, is over 120 lbs., which will float six men with their heads and shoulders out of the water, but the indestructible buoyancy of cork is the only reliable buoyancy.

Mr. ROPER: My raft, to carry 400 men, weighs scarcely 4 tons. Had the "North-fleet" had a raft of that kind, with a raised cabin in the centre, holding from 150 to 200 women and children, all would have been saved, and where you have a poop and forecastle to your vessels, you could have an extension of those decks on the raft principle; they would carry all the people on board, and come very much lighter than the boats.

The CHAIRMAN: It only remains that I should propose a vote of thanks to the lecturer for the paper which he has read to us. I am sure the meeting will have great pleasure in complying with that, and also in thanking Mr. Roper for his explanations.

Monday Evening, 6th May, 1878.

ADJOURNED DISCUSSION.

REAR-ADMIRAL JASPER H. SELWYN in the Chair.

Admiral RYDER, who had moved the adjournment, having preferred to defer his further remarks to a later hour of the evening,

Señor DE LA SALA said: I had not the pleasure of hearing the interesting paper of Commander Gilmore in March last, on the subject of "Life-Saving Apparatus for Men-of-War," but on reading a report of it in the newspapers, I was much struck with some of his views, and also with those of other gentlemen present on the occasion, because they touch very closely upon some ideas of my own on the same subject, consequently I had the honour of bringing them under the notice of Admiral Selwyn. It seems to me an abnormal state of things that the minds of men should be mainly directed to the study of the most effective means of destroying life, leaving untouched, or but little thought of, the far more noble and important question of the *saving of life*. England possesses the finest fleet in the world, and, considering the cost of her modern men-of-war, it is but right that every means should be taken to ensure their safety. England also possesses the finest and most daring seamen, or, as the First Lord of the Admiralty said two days ago at the Royal Academy Banquet, "the most magnificent of crews;" surely, then, on the principle of thoroughness and logical consistency, no expense should be spared—no means left untried of protecting their lives from the many dangers to which they are exposed. It has now come to be generally understood that something must be done in the way of producing more effective life-saving apparatus than is at present in use. In the production of this, some important considerations are involved, chief of which are, cost, bulk, capacity, and readiness for use. Keeping these in mind I have endeavoured to construct something which I believe embraces these four points. In the small models which I shall presently have the honour to submit for your inspection, you will see the principle upon which, what I would call folding raft-boats, are constructed (see Figs. 3, 4, 5). This is a combination of thin strips and boards of pine and cork, covered by waterproof canvas, and arranged in such a manner that from their folded and flat condition they can, by a simple handling of cords, be pulled into the form of a boat ready for use. Another advantage is, that it is not necessary to pull the structure into the shape of a boat before dropping it into the water, for it can be thrown into the sea in its folded condition, and there pulled and turned into a boat by any one who can swim. Being adapted either for folding or to remain flat, it is thereby a great economizer of space—a very important consi-



deration, as it enables a ship to carry a large number of them without causing obstruction or inconvenience. In fact, they could be packed and placed in any available place on board. Constructed on the most elementary of plans, and of the most simple materials, the cost of this description of lifeboat would be trifling compared with that of all kinds of boats constructed at the present time. With the necessary materials at hand—which are always to be found on board of any vessel—the time required to make a folding raft-boat would be comparatively short. Further, it requires no very extensive knowledge of boat-building to “turn one out.” With a little practice any one could make his own lifeboat, all of which is an advantage in the way of economy and resource. They can be made of any size, but for prompt, life-saving purposes, perhaps folding-rafts of the dimensions of an extended hammock—and serving also as a hammock for the sailor—would be the most serviceable kind of small life-canoe. However, the question of size need not be fixed. If we can get what we want to keep men afloat and *above water*, it can afterwards be determined what size is the most convenient and useful. Means, such as the life-belt, buoy, or floating hammock to keep men afloat, are better than nothing at all, though immersion of half or two-thirds of their bodies is not always pleasant, especially if it be for a lengthened period, or even a few hours. Now, a contrivance that enables a man to keep afloat and *out of the water* protects him from the imminent dangers of death to be encountered in all seas. Raft-boats on a large scale must be made of materials possessing good floating qualities. Cork is a good buoyant substance, but wood can be made more buoyant than cork, and cork itself made still more buoyant, and at the same time stronger, by the system of tubular cells inside the boards (Fig. 6). I present you with various samples of what I may be allowed to call the tube-insertion or tube-joining system. The wood, you will observe, is tightly joined together by tubes which, over a given space, give to it a large proportion of buoyant power, without impairing the required resistance of the material. It is therefore manifest that boats built on this plan acquire very great powers of flotation. In fact, it will be evident to you that this system could be advantageously applied in many other constructions. If the whole *dead work* of a vessel were made on this system, a *life work* would be at hand in case of need. Cabin-doors, tables, and every possible bit of furniture would float like pieces of cork. One of the chief considerations to be borne in mind is that in securing these advantages there is no additional cost, but on the contrary perhaps a saving, owing to the economy in material, and by the aid of proper machinery to execute the work, small pieces of wood could be utilized to make light and very strong boards of any required length or width.

The CHAIRMAN: What weight will the hammock carry?

Señor DE LA SALA: It is only intended for one man.

(Models of rafts and boats constructed on this principle were exhibited by Señor de la Sala; also specimens of pine boards and cork planks treated on the tube-joining principle, by which it was shown that a pine plank thus treated was in its specific gravity .064 lighter than a solid cork plank, and cork was reduced 33 per cent. of its specific gravity by the same process.)

Commander CURTIS: I should like to make a few remarks with respect to the models that Señor de la Sala has shown us. I saw Miss Beckwith swimming at the Westminster Baths, and also Captain Webb, who, as you know, swam across the Channel, swimming at Cheltenham in the ornamental water in Montpelier Gardens. He had an invention consisting of waterproof canvas, with wooden sides, and the way he got upon that apparatus was by half-hauling it under him, and so clambering up like a seal to the end part of his raft. Miss Beckwith tried to get on to the raft, but was not able to do so. That raft was made of boards, 8 feet square. There were no barrels under it, and she could not get on until her father held the other end, there being no stability in the raft. The same thing will apply to what the Señor has brought before us. His raft is very good, provided you can get into it. It, however has no stability in itself, and a person in the water would have to haul it under him in order to get into it. I scarcely see how any one is to get into that boat, unless one person gets in on one side and another on the other, as we see the natives do with their canvas rafts on the coasts of Africa.

Señor DE LA SALA: There are several Spanish steamers in which these boat-rafts

are used. I shall be most happy to invite you to Millwall Docks any day to see it tried on the "Cervantes" and other Spanish steamers. They have been tried on a larger scale. Of course it is not so easy for a man to get into one of these boats when it is in the water, but as the floating power is so great, the boat will be always out of water.

Commander CURTIS : Would you launch the men in the boats ?

Señor DE LA SALA : They may be launched in the boats if they like, but if they are in the sea, they have to get themselves in. They can keep themselves upon the boat because the boat will not sink.

Commander CURTIS : If two or three men tried to get in on one side, the boat would turn over upon them.

Señor DE LA SALA : You can satisfy yourself as to the practicability any day you like.

The CHAIRMAN : If no other gentleman rises on this particular part of the subject, I think the meeting will allow me to say that Señor de la Sala has at least shown us a very new way of using wood and canvas, and his models show great ingenuity and deserve great attention, although there may be some little difficulties as to how a man shall get into them when they are in the water. As long as there is the floating object there, I think drowning men will scarcely fail to catch at such very good straws as these.

Mr. EDMUND THOMPSON : Since coming into the room a paper has been put into my hand from the Society for the Encouragement of Arts, Manufacture, and Commerce, on the question of "Saving Life at Sea." A gold medal is promised, but one very important point is that neither boats nor rafts will be admitted to the competition, on the ground that it is almost clear that in the contemplated cases of abandonment, neither of them could be lowered or cleared away in time, and because even if boats stowed outside could be cleared away, there would not be really sufficient space to provide means of safety for all the crew and passengers. That is exactly what I am going to show you to-night is possible to accomplish. I have been many years interesting myself in the question of saving life at sea, and I hope to show you that it is absolutely necessary, and that it is both simple and possible to carry boats and appliances in the way of rafts to save *everybody* on board. In looking at the Board of Trade returns, I find that during the last ten years no less than 30,000 lives have been lost by accidents by shipwreck on our coasts or in British shipping abroad ; and if we just look at two or three cases, such as those of H.M.S. "Captain," the "Cospatrick," and the "Birkenhead" (of olden times), which I very well remember, and to the more unfortunate one of H.M.S. "Eurydice" the other day, we find all these instances show that what we want is a certain instantaneous mode of getting effective boats and rafts, not merely makeshifts, into the sea. What we do want is a good boat and a good raft which has good oars, sails, and all other appliances for going on a voyage, and also provisions and water for the maintenance of its passengers for a given number of days. I think if I can prove to you that this is possible, I shall then have satisfied you that in point of fact what the Society wants, and what the world wants, is practicable ; and that people need not go to sea in ships and be under an uncomfortable feeling that there is only means provided (even if the boats can be got overboard, which very seldom happens) for the safety of a mere portion of the crew. I have been connected for many years with the emigration trade, and also with troop-ships during the Crimean War, when we had to fit out some steamers for carrying troops to the Crimea. What has always struck me painfully was that, do what we could with all our appliances, the number of boats was most inadequate, and the mode of getting them overboard was still more so. I have unfortunately had two melancholy experiences during a long course of loading and owning vessels, and they both occurred with the same ship. In the first case when with 500 passengers on board, bound for New York, the vessel, being improperly ballasted, and having her weight too much below, lost her masts and was brought back a derelict. This vessel, on a subsequent voyage, while chartered by Her Majesty's Emigration Commissioners, and certainly with as fine a crew (with passengers 500 souls) and appliances as perfect as then possible, was never heard of again. These two circumstances made me determine to devote my time and my money (for unfortunately I have devoted a great deal more money

than I should have done) to the devising of means by which these accidents could be prevented in whole or in part. I lay down the propositions—first, that boats shall be so constructed that they shall be practically unsinkable; secondly, that they shall have enough accommodation for stores and water for a reasonable time, say twenty days, for everybody; thirdly (and I will include rafts as well as boats), that every vessel shall be compelled to carry a sufficiency of these rafts and boats to save every soul on board; and, fourthly, that an arrangement shall be made, by which these boats can be put into the water in an instant of time. I do not want five minutes; I want only comparatively an instant of time that, even with everybody on board, but at all events the boats themselves may be instantly placed in the water; my theory being first to get your means of safety into the water (whether with or without your passengers), and the chances are the passengers may, and most probably will, by appliances which I should certainly recommend to be carried—such as cork life-saving apparatus, and that sort of thing—be able to get into the boats. Some three years ago I made some experiments at Blackwall, when Admiral Sir Alexander Milne, the late First Lord of the Admiralty, Lord Gilford, Admiral Sir William Mends, and other gentlemen were present, but my experiments were unfortunately clouded by one catastrophe—the boat capsized from the launching apparatus, the fact being that she did not fit the ways. Admiral Milne, with his usual kindness and courtesy, suggested to me: “Do not be disheartened with that; rest assured you are in the right direction. But why cannot you put your means of flotation, that is, the air-tubes, outside your boats, instead of inside? Our Officers all complain that the manner in which lifeboats are fitted with air-tubes inside is exceedingly inconvenient, and occupies a great deal of unnecessary room.” He maintained, as I afterwards proved satisfactorily, that by placing the tubes *outside* the boats I could get the buoyancy I required. I may say that by using steel as a material, I am enabled to produce a raft and boat, not occupying more than 12 feet length of the vessel, and acting as a Captain’s bridge, that will save 250, if not 300 people, providing accommodation for stores and provisions for twenty days for that number of persons, the weight of the boat and raft not exceeding 5 tons. The model before you (Figs. 14, 15) represents the section of a ship with a raft or launching platform. The model is on the scale to fit a vessel of 40 feet beam. The launching platform constitutes the raft which has a double deck (Fig. 16). When it is put under water, it rises and empties itself entirely, as you see. The boat is a decked double cylinder-boat (Fig. 17). I first get the boat into the water, 15 feet from the ship’s side, and then the raft by a similar arrangement, and the two together will hold 250 people. The raft and the boat can be launched from either side of the vessel instantaneously; you simply have to withdraw a bolt, as in my opinion anything connected with the lowering or launching of boats should be done instantaneously by one action and by one man. I further contend that every boat ought to be a decked boat, and that an undecked boat is absolutely unsafe. She must have weight in her, which I supply in the way of provisions, as if she has not such weight, she must have water as ballast. Of course, it is of no use having a boat or a raft unless any sea coming in can go out as fast as it comes in, and these boats are arranged for that purpose. If you had a raft of this kind 60 feet long and 20 feet wide, it would carry 300 people, and occupy in effect no space over 2 feet in depth more than the ordinary bridge of the vessel, and would not weigh over 4 tons.

Admiral FISHBOURNE: Allow me to ask how far they are unsinkable, that is to say, what amount of injury will deprive them of flotation power?

Mr. THOMPSON: Nothing but a total smash up. They are in about fifty or sixty compartments.<sup>1</sup>

<sup>1</sup> The Chairman, having ruled that my time had expired, I was unable to sum up my remarks, which would have been to the following effect:

1. That undecked boats are dangerous in a sea way, being liable to be swamped or capsized, and that the present mode in which they are carried on board ships is unsatisfactory, as are the means used for getting them afloat;

2. That no ship should be allowed to proceed to sea without a sufficiency of duly provisioned boats and rafts to save everyone on board;

3. That the decked “cellular-sided” steel boats and rafts, of which I produced



MR. LANDER : I am like Mr. Thompson ; I have been a great many years in the boat trade and have served a few years at sea. I think men who have been to sea are best able to judge what is most requisite for saving life at sea. It is our duty, as Englishmen, to sit down and study the best means of saving our fellow creatures' lives. I have been, ever since the loss of the "Northfleet," seeing what means I could devise to save life at sea. I have been engaged for a great many years in fitting up lifeboats for passenger ships, and I have found that tanks inside boats, if they get stove in lowering or in any other way, are almost useless. I do not see the good of those copper and zinc tanks that we put into boats for saving passengers on passenger ships, for the tanks are very little service until the boat is full of water, and what is a crew going to do with a boat full of water? She is almost useless. Not only that, but we find the tanks inside our lifeboats are very cumbersome. When our boats are crowded with oars, and so on, there is scarcely room for the crew, let alone passengers. I dare say some gentlemen present may have been overhauling these lifeboats, as they call them, for saving ships' crews at sea (for passenger ships are compelled to take them, according to the Board of Trade), and you would find, if you were to get into one of them, by the time the crew is there, there is very little room for passengers. You might certainly stow some under the thwarts. Then, when we lower our lifeboats, we find, on a dark night, one man runs to the fore davit and another to the after davit to let go the falls, and perhaps the man at the fore davit cannot see what the man is doing at the after davit ; he lets go, and the consequence is the boat is bottom upwards in a very short time. Mr. Clifford has a plan that I saw used the other day. It is a very good idea, but as soon as the boat got into the water the men had to overhaul the whip ; it took him a minute or a minute and a half after it was lowered. I have a method here which unhooks itself. It is simple. We all know what seafaring men are ; the less they have to do with machinery the better. I will now show you my plan of collapsing rafts (Figs. 1 and 2). I have here falls by which to heave the raft up. By letting go the falls, which work round a drum, the raft would be in the sea in an instant. I have a large raft at Newhaven, 24 feet long and 9 feet wide. It consists of cork and light wood, and three inches solid cork round the sides. I put in the thwarts at each end above the hinges, which prevents them closing. I have stanchions and a man-rope to go right round. I have rowlocks for oars, all fast inside. In the one I have at Newhaven, I have a spraycloth passed right along, and it comes up and forms 3 feet of bulwark. I have a bread tank that holds 1 cwt. of bread, and a water tank with 26 gallons of water ; an axe, and everything that is required, all on board. There is a mast and lug sail. The weight of the raft would not be so heavy as that of the common lifeboat. Weight is an important element in a boat to be carried on the davits.

Captain CROZIER, R.N. : May I ask what use that raft would have been to the "Eurydice," when she turned over the other day?

MR. LANDER : It would have swung clear of the ship.

Captain CROZIER : Why would that have saved life on the "Eurydice," any more than any of her own boats?

MR. LANDER : It is unsinkable.

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models, being very light and unusually strong, and capable of being carried in such a manner as to be no hindrance to the working of the ship, fulfil the foregoing requirements, inasmuch as a boat and a raft, each 40 feet long by 12 feet wide, which constitute a bridge on board, can carry 250 to 300 persons, weigh less than 5 tons, and are capable of storing water and provisions for twenty days ; further, that the method I showed for launching and lowering boats (the latter by diagrams) is all but instantaneous in operation, and immediately available, and that, in both cases, the boats are placed in the water 15 or 20 feet from the ship's side, which obviates the risk of swamping. At the same time I wished it to be understood that I did not undervalue subsidiary means, such as the hammocks recommended by Admiral Ryder, or even the light cork boats of M. de la Sala, either of which might give persons confidence in going into the water, and afford them flotation until picked up by the boats, as, under certain circumstances, there might not be time, or it might not be prudent, to embark passengers in boats previous to launching.—E. T.

Captain CROZIER : Her own boats were unsinkable, if they came up ; but they never came up.

Mr. HOLMES : It is hardly fair to put it in that way. If all the crew and passengers, &c., are below, and the ship goes down, it is almost impossible for any of them to be saved.

Commander GILMORE : Is there no means of turning the davits inwards ?

Mr. LANDER : You turn the davits, raft and all, inwards, the same as any other boat.

Commander CURTIS : Do I understand you lower the raft without any people on board, and the people have then to get into it ?

Mr. LANDER : Yes.

Commander CURTIS : That is to say, the passengers have to scramble on to it after it is afloat ?

Mr. LANDER : Yes. I think I would rather take my risk of getting on to a raft like that than be launched into the water. I have no faith in launching rafts or anything from the broadside of a ship. If a ship should happen to roll just when Mr. Thompson's raft got on the balance, where would it be ?

Commander CURTIS : I think it would be an improvement if you had a kind of traveller, and had towing hawsers, because you do not appear to have explained how it would go if the ship is at speed. If the ship was to give a roll, your raft would go into the ship's side.

Mr. LANDER : It would not hurt it ; it would not be like a boat. If a boat did, she would be stove.

Admiral RYDER : What was the weight of the boat you built ?

Mr. LANDER : I could not give the weight exactly ; I should think about the same weight as a common lifeboat, by the time it was fitted up with tanks and water.

Mr. ROPER : I explained my model on the former occasion, but I will show the arrangement for lowering it. My raft takes up the ordinary position of a Captain's bridge. Instead of having a deck that will sink with the vessel, I put a floating power, built on the cellular principle, with either a flat, round, or corrugated bottom. The bulkheads going across, form a transverse girder, and if a ship was to founder suddenly, then, by the simple action of a lever sliding a series of bolts through the iron girders it rests on, the raft is free, and it would float away ; or if the ship was on fire, and it was necessary to leave the wreck, then, by lowering the bulwarks, you can prepare to launch your raft, which is done by throwing two levers down that release two tumblers, similar to letting go an anchor from the cathead of a ship ; you then lower it either by a tackle or a brake, or by any other simple arrangement. The raft carries watertight seats holding provisions, a compass, ropes, masts, stores, and sails. We have everything ready ; there is no rope to cut away, but everything is ready, and in the dead of night a lad, or even a lady, could launch it. In the case of the "Eurydice," if the tops of the chart and deck houses had been made on the cellular principle, they would have floated. The upper deck of a war-ship could be fitted upon that principle. I have a block model, showing the upper part of the "Glatton," one of your war-ships. This flying deck might be formed into a raft on the same principle, and would be self-floating. And then the space outside the armourclad round the turret could be made into a series of floating rafts, in case of foundering. I have looked at many of the models of our war-ships, and I can hardly see one where a raft on this principle, which is very simple, might not be constructed. Every available space could be utilized in this way. On this upper deck here is a space 28 feet by 24 ; this could be made into a raft, and would be self-floating. Had the "Northfleet" been fitted with a raft on this principle, I think everyone would have been saved—there was ample time. It carries sails and everything necessary, stowed away as clean as you see is the case on the working model. If there is specie on board, and there is time to get at it, it can be stowed away in these cells, or the mails might be saved in the same way.

Admiral RYDER : Is steel your material ?

Mr. ROPER : I prefer steel, in fact, although Mr. Thompson has spoken about steel as if it had only been recently introduced, it has, of course, been used for many years. He has gone rather back in his pedigree, but I think I have the advantage over my friend of about five years, in connection with shipbuilding, and,

in my patent, I have included fitting ordinary decks upon this principle, and making them of steel. I have no hesitation in saying, since my patent has been taken out, there has been a large number of infringements.

Admiral HAMILTON: Would you launch this raft about half way down? Is there any chance of that arrangement jamming, if she has any way on her?

Mr. ROPER: No possibility of jamming; there are friction rollers on the side and bottom.

The CHAIRMAN: What is the result of straining it fore and aft.

Mr. ROPER: The strain would come on to the friction rollers. I may mention that Admiral of the Fleet Sir George Sartorius, has written two letters to the *Times* upon the raft, in which he states that he believes it would live out any storm, and form a breakwater for boats to hang on to.

Admiral FISHBOURNE: Narrowing the two extremities, and making it more ship-shape, would get rid of any difficulty of its jamming.

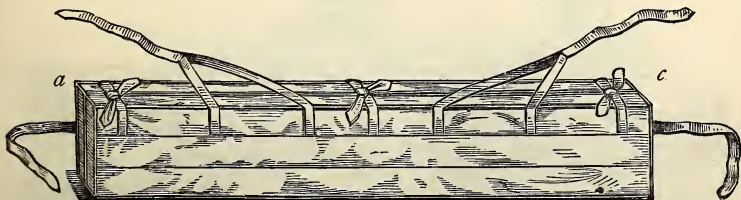
Mr. ROPER: No doubt; some naval men have suggested that.

Commander GILMORE: My model is not at all on an ambitious scale; it is merely a raft placed at a convenient point on the ship's deck. (Fig. 7.) It is made in cylinders with a packing of cork to prevent its being broken by the concussion of heavy guns. This [Diagram] (Fig. 9) shows the raft, and, of course, if it stood on the deck in its crudeness, there it would be difficult for men to walk over it, so that I have placed fore and aft on each side an inclined plane for the men to come on it. (Fig. 10.) There are tanks for water and provisions. For lowering boats, on the outside I have an iron shield surrounding the boat, you can either hang the boat on the davit or bring it inboard. As you lower from here, the boat falls out quite clear of the ship's side. This figure (8) represents the raft being launched; it goes upon rollers; the bulwarks falling out form a launching way for it. This, however, is merely a makeshift and not on the scale on which Mr. Roper's system is carried out.

The CHAIRMAN: I think I may recall gentlemen who are present to the fact that the paper read touched on the minor means of saving life at sea, such as would be always available where no possibilities of launching rafts or boats existed. I think Admiral Ryder has something still to say on that subject.

Admiral RYDER: I was allowed to make a few observations on the night Commander Gilmore read his paper; since then Her Majesty's ship "Eurydice" has been lost, and the gravity of the question is, if possible, increased. I thought you would like to see a seaman's hammock with the proposed cork mattress in it, and the waterproof sheet, which, when both are adopted, will bring the "buoyant hammock," according to our present lights, as nearly to perfection as possible. This (pointing to a lashed-up hammock, containing a cork mattress and a waterproof sheet) is about the size of rather a stout hammock for a seaman, but less than the midshipman's or steerage hammock; this hammock might be made still smaller, by having a little less cork in the mattress, but, of course, at the sacrifice of some buoyancy.

FIG. A.



It has in it a cork mattress, see Fig. A, weighing 12 lbs., with a buoyancy of 60 lbs., which will float three men with their shoulders out of the water. The additional temporary buoyancy, due to the waterproof sheet, exists as long as the water does not get inside the sheet, and is about 60 lbs., or 120 lbs. in all; six men, resting their hands upon this buoyant hammock, would float with their shoulders out of the



water. The idea of making hammocks buoyant has been carried out in the following way, viz., by stuffing the mattresses with granulated cork instead of hair, the cork being a very much cheaper material, 12 lbs. of granulated cork, which is sufficient to stuff a seaman's mattress, will cost less than two shillings (retail price).

FIG. B.

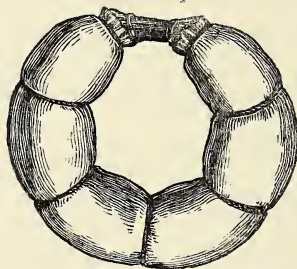


FIG. C.

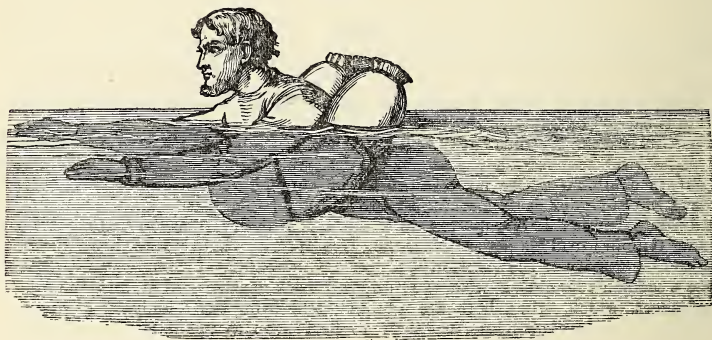


FIG. D.

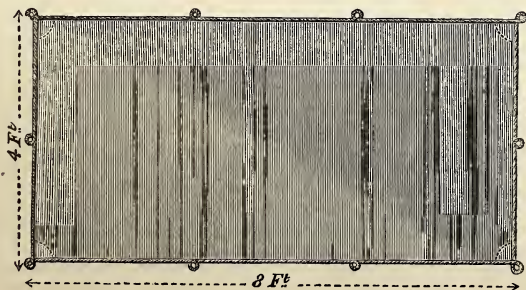


An equal bulk of good horsehair will cost ten shillings. For the sake of the men's comfort, when the Admiralty experiments were tried, four years since, as they criticized the original cork mattress and wanted something more comfortable, I introduced about an inch thickness of hair on the top of the mattress. Such a mattress can be supplied to the men at about the same cost as their hair mattresses, and much cheaper if made in the dockyard. With the waterproof sheet between the hammock and the mattress, the hammock, as has been already said, has not only a permanent buoyancy of 60 lbs., but also a supplementary buoyancy, but not so permanent, of 60 lbs. more. The sailor is perfectly familiar with the way of casting the clews of his hammock adrift. When the man is in the water he ties the clews round his waist, see Figs. B, C, or two men between two hammocks, see Fig. D, with their arms resting over them, are floated almost at their waists. The object of making hammocks buoyant is to enable men-of-war's men to be saved by being floated for a short time when their ships have to be abandoned at very short notice, say in a few minutes. In some passenger ships the mattresses and cushions have, for years, been stuffed with cork, but, as yet, there is no obligation so to fit them. Of course, if there is time to launch rafts and lower boats, it would be madness to neglect them for buoyant hammocks. One of the speakers told us he could launch his raft in one second. Wonders will never cease: he may, perhaps, be able to invent a means of launching a raft in that time, but if he fails to do so, and I am a little suspicious of his success, it is surely advisable, and it is certainly thought so by many, that there be a means on board of saving, that is to say, floating for at least a short time, say a few hours, everybody on board. Such appliances should, evidently, be close at hand, available immediately, and, as far as I have seen at present, I do not know of any other means than utilizing the hammocks, which, in men-of-war, are generally carried on deck. The nettings ought always to be so fitted as to allow of the hammocks being easily extracted. We have had several cases of loss of men-of-war, with, of necessity, almost immediate abandonment. I believe, in many cases, viz., Her Majesty's ships "Bombay," "Orpheus," and others, a large number of the lives might have been saved if their hammocks had been made permanently buoyant. I feel perfectly confident, and I know my opinion is shared by a large number of experienced Officers,<sup>1</sup> that in the "Eurydice," if the hammocks

<sup>1</sup> If the "Eurydice's" nettings were partially boxed in, as has been asserted, the hammocks would have been less easy to extract, but had they been buoyant many would have been got at after permission was given to do so, and for the future "boxing in" should be abandoned.

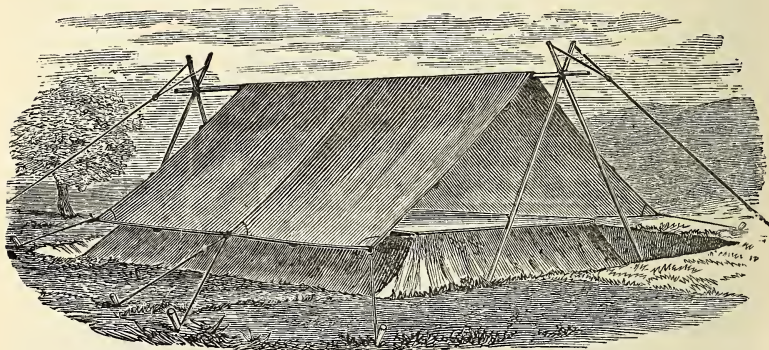
NOTE.—Figs. E and F show the use of the calico waterproof sheets when the men are landed as a Naval Brigade. Sheets of a waterproof (india-rubber) material are issued to our troops in the tropics when campaigning. They are much smaller, much heavier, much more expensive than the stout *calico* sheets prepared with boiled oil, 8 feet by 4 feet in size, as recommended by me, and they do not stand

FIG. E.



had been buoyant the men who were really standing on them, had their feet touching them, could have extracted many of them, while others would have extracted themselves and floated to the surface. Perhaps the hammock cloth was hauled over and secured, but this could have been cut adrift easily in a few seconds. Having been exercised when bathing, the men would have fastened their hammocks round them, see B and C, and floated safely for a number of hours, varying according to their physical powers of endurance; at all events, they would have had the same chance of being picked up as the two men who were lucky enough to come across the two life-belts in the water. After Commander Gilmore's lecture in this theatre, a

FIG. F.



rough usage nearly so well, nor are they easily repaired; the short campaign in Malacca ruined them.

It will be seen that there is a light roping with beackets round each calico sheet. The sheet weighs, after being waterproofed and roped, less than 4 lbs.

The size selected by me, 8 feet by 4 feet, is sufficient to protect three men of moderate size from the damp when lying down on ground, prepared as in F with a surrounding ditch, and two sheets will form a *tente d'abri*.

The sheet affords a perfect protection as a cloak to men on sentry.

The Chinese, at Hong Kong and elsewhere, largely use waterproof preparations of boiled oil for clothing. The man I employed at Hong Kong to waterproof several sheets would not give me the receipt, but I ascertained that the ingredients were boiled oil, soft-soap, and bees-wax. I have tried experiments and found that one quart of oil, with which had been carefully mixed one ounce of soft-soap and one ounce of bees-wax, boiled down to two-thirds and rubbed into calico dried in two or three days, and after that was neither sticky in extreme heat nor stiff in cold—boiled oil when used alone will not stand extreme heat, but sticks. A thoroughly satisfactory waterproof sheet will enable the Commander-in-Chief, when organizing a naval brigade in the tropics, to dispense with great coats and blankets, provided the men are dressed in serge. The adoption of a satisfactory waterproof sheet for the Royal Navy will answer, therefore, two important purposes, viz., largely increase the buoyancy of the hammocks, and place our men in the same, I may go further and say in a much better, state of preparation for a campaign on shore than their brethren of the Army.

I have distributed round the theatre the annexed Circular of the Society of Arts. If the Council will allow it to be printed in their Journal, attached to Commander Gilmore's paper, of which paper and of the discussion here, it is one of the most important results—they will help to confer a great benefit, not merely on our Officers and men, but on the profession generally and the country at large. The Journal of the Royal United Service Institution penetrates where the announcement and offer of the Society of Arts will not reach unless attached as I suggest.—A. P. R.



Mr. Hely wrote to me and said that about thirty-two years ago (and I was able to substantiate all his statements) he brought an invention for saving life by means of waterproof covers to hammocks, &c., before the public, that Prince Albert inspected it at Portsmouth, and the Admiralty sent down Officers to report on it, also that he received the Isis Medal from the Society of Arts for it. Mr. Hely's invention, now over thirty years old, was really what I fancied had not been previously thought of, until I brought it under the notice of the Admiralty four years ago, viz., having a waterproof covering for each mattress. Mr. Hely crossed over to Calais on a raft made of these buoyant sacks, and he was the first person, as far as I know, who brought to a practical trial the obtaining buoyancy by having waterproof sacks, &c. I cannot help thinking a combination of the two is the best thing we could have, the cork mattress, which gives a permanent buoyancy of about 60 lbs., and, in addition, the more or less temporary buoyancy of the large waterproof sheet, not less than 8 feet by 4 feet, between the mattress and the hammock.

Mr. CULLIS: I may perhaps claim to occupy a few minutes of your time on the ground that I have devoted some attention to this matter, and have worked out some of the details of this raft of Mr. Roper's. For this reason I am very likely to be prejudiced in favour of it, but premising this, I wish to point out one or two weak points, as they seem to me, in the schemes before you. Señor de la Sala has brought forward a valuable and interesting invention, but the objection to this and similar schemes is that it does not meet the great difficulty and necessity of providing for the escape of a large number in a body, and of affording them some means of sustenance if shipwrecked in mid-ocean. I venture to say that death at once is almost more desirable than the prolonged torture endured by a man cast away in a tropical sea, perhaps, with his head kept above water. With regard to all these inventions for providing individuals with means of flotation, the weak point is that you provide for isolated units, but the raft system has the advantage of keeping them together, so that the strong are able to help the weak, and women and children stand some chance of escape, and then you have provisions at hand, which also is a very important point in favour of the raft. Other reasons can be urged why the raft or boat system is so preferable, such as the possibility of navigating such life-saving apparatus and making for the nearest land. We have in the raft or boat system of Mr. Thompson, no doubt, a very ingenious one. I had the pleasure of seeing the first experiment to which Mr. Thompson has alluded, and I must confess that my satisfaction was somewhat marred by the upset of the boat on this trial. Of course such accidents are very liable to happen in first experiments, but it seems to be a grave objection to this scheme that you launch the raft and boat from so great a height. You must at least have seven feet under your beam to afford head room; that throws your launching apparatus up very high, and centred as the beam is amidships, you necessarily raise one end of the beam as much as you lower the other, throwing up one end of your raft to a great height and dangerously increasing the angle of your launchway. This difficulty is obviated in Mr. Roper's raft by lowering the launching beam from either end, as circumstances require, right down on to the deck, thus launching with a much gentler slope (just half the angle which the beam makes if centred amidships), and you have also the great advantage of the outboard sliding rails, which almost brings the launching end of your raft into contact with the water before the other end has left the ship. Then I think it must be patent to everybody that a raft of the dimensions and construction shown in Roper's model is very much less likely to capsize (indeed it is almost an impossibility) than any structure of the boat shape. You have also the advantage of making the very utmost of the room at your disposal. In Mr. Thompson's boat-raft you have rounded ends and bottoms, which, however advantageous for some things, involve some loss of space. It is obvious that, as compared with any boat-formed structure, the flat rectangular raft secures the maximum of buoyancy with the least demand upon the ship's space. Roper's raft is constructed on the cellular principle, which is the very best possible for gaining strength and buoyancy. But I think if, point by point, careful comparison be made of the advantages of the respective plans—for instance—as to buoyancy, space occupied in proportion to the numbers carried, facility in launching, strength and stability, Mr. Roper's system would be found to have the advantage every way. On a raft of this size, you could carry

nearly 400 as against the 250 persons Mr. Thompson proposes to provide for. The weights of raft have been carefully calculated, so have the weights of passengers and provisions and the displacement; and I may very safely say that such a raft of these dimensions would accommodate 400 people with provisions and all appliances.

Captain CROZIER, R.N.: May I ask the dimensions of the raft?

Mr. CULLIS: 40 by 20.

Captain CROZIER: You could not carry 400 people on it. I am under the impression that the question of saving life which at the present moment we are discussing is not so much with regard to merchant ships as to ships of war in the event of collision or action, and I take it that that raft would be very little service to us in the event of a general action taking place. That raft in the first place, would be liable to be destroyed by shot or shell. There is another thing to be said also as far as that raft is concerned. It is a very simple matter to lower it into smooth water, but when a ship is rolling 30 or 40 times a minute it becomes another question, because at the time the ship was rolling she would be more or less disabled, and she would roll possibly almost as much to windward as leeward. If it gets away from the ship what is to prevent it being smashed up by striking the ship as it meets the ship on the roll? How are the people to get on board? I take it the kind of thing we require is some means not so much for launching rafts (when there is no time to do it) but for the water to act upon a portion of the ship's deck and so float that portion away and allow the men to get on till assistance can be secured. We always as a rule place water and a certain amount of provisions in our boats ready for lowering, but I take it all the appliances we have seen, excepting the hammock which Admiral Ryder has spoken of, would only be of use to us under circumstances where we have nearly smooth water, or at all events when the ship was going down through a leak or anything of that kind, but not in a heavy gale of wind, with the ship rolling and I may say being perfectly unmanageable. I had the honour of commanding a small ironclad gunboat some time ago; she was divided into compartments, and the hatches which formed her principal safety were screwed down when the ship went to sea in order that the water should not get below, and so that she would have a certain amount of floating power. It seems to me there is very little difference except that these were iron. We might have a portion of our hurricane deck or quarter deck secured in such a way as in the event of a ship suddenly coming to grief, with a sharp knife or something of that kind a portion of the deck might be disengaged which would afford some means, at all events, of saving life. When the "Eurydice" was capsized, there were vessels in sight, and if a portion of the deck only could have been kept afloat, a certain proportion of her crew would have been saved. The appliances we have seen, although useful in merchant vessels, would be of little or no importance to us if the ships were engaged in a naval action.

Mr. ROPER: I think I have explained that for a man-of-war, my principle can be adopted to form the ordinary deck of a vessel; it is in my patent that a deck could be self-floating in case of foundering, and the tops of the deck houses also.

Mr. THOMSON: Mr. Roper has made some observations as against my principle. I consider his a most inconvenient arrangement, because the structure stops the action of the deck absolutely. The fact is I get really and absolutely a nearer approach to the water than he does, and certainly more quickly. There is no appliance in mine except one single action. I object also to cutting the bulwarks.

Mr. WOOD: One gentlemen spoke with regard to rafts in case of a ship in action being liable to be struck by shot or shell. Of course Mr. Roper has not placed before you a raft which is shot-proof, but by a simple mechanical arrangement, it can be lowered on to the deck, and I imagine it would then be protected from broad-side fire. Besides that, even if struck, being partly composed of cork it would retain its buoyancy to a considerable extent. With regard to the launching of a raft I should imagine the weight of it would give it a velocity that would carry it almost clear of the ship.

The CHAIRMAN: I will say one or two words, which are these: that in this Institution we have no sympathy whatever with rival inventors. We are here to discuss a great object, that of saving life at sea under circumstances of difficulty and danger, and if gentlemen who come here would only recollect that what one invention may

supply in one direction may be still better supplied in another direction, they would not waste so much time in arguing a question which does not interest an Institution like this. It is quite clear to us on board men-of-war we have to consider a case in which the ship herself is not proof against shot, and still less in structure of deck. Her bulwarks would offer no protection whatever against such shot as would be directed against them. Under those considerations it may be easily seen how an Officer with the experience of Admiral Ryder, has chosen rather to advocate that which is not subject to those disadvantages. This hammock would unquestionably prevented a very large proportion of the loss of life that we all regret took place since I last occupied this chair. It is not a question to-day of what you would do if you had plenty of time, and how you would utilize well devised appliances, but it is what you should do in order that each man may feel (particularly on board a man-of-war) knowing when the ship is sinking from under him, and the boats are all shot to pieces, that there are still floating objects to which he may address himself in order to save what is left him—his life. In a fleet action it is quite clear that there would be sufficient aid at hand to pick up those able to float about for a time. So generally in such cases as the "Eurydice," not far from land, subject therefore to heavy squalls which she might have passed through quite regardlessly had she been in the open sea, there was a position in which unmistakably these hammocks would have saved life. We all know that if a shot struck any machinery of that kind (pointing to a bridge-raft) you could not rely on the action of a single portion of it, a lever is bent, something goes wrong, and it won't work. But with a hammock no such objection exists; they are already in the hammock-nettings on the edges of the ship, and they are there detained by so very slight protection as to be easily got at by any seamen at any moment. The instant a sailor comes up on deck, finding his ship sinking under him, he is able to rush to his hammock, having been thoroughly drilled to the use of it, and knowing beforehand that it will afford him perfect safety. Under those conditions he retains the presence of mind which you would in vain seek for by any uncertainty whatever. With these few observations I will call upon Commander Gilmore to make whatever rep'y he deems necessary.

Captain CODRINGTON, R.N. : I have heard it stated several times in public that the hammocks were so exceedingly accessible, but I beg leave to call attention to the fact that the "Eurydice's" nettings were built in a wooden and not in an ordinary hammock box. I think Sir Leopold M'Clintock will bear me out in that, and the whole of the outer part of the netting is wood with iron bands over, and a very small portion of hammock cloth at all. It would be a very difficult matter to get the hammocks out of the netting. They could not float out, the men could not cut the cloth off, and under all ordinary circumstances it is necessary for the men to drag them out of the nettings.

The CHAIRMAN : All naval Officers present will recollect that that must be classed under extraordinary fittings.

Captain CODRINGTON : No, every man-of-war at the present time is fitted in that way. I do not know any ship that is not at the present moment.

Commander GILMORE : The short paper I had the honour of reading the other night was more for the purpose of creating discussion upon this very important subject than for the value of the paper itself. To-night we have had some very beautiful designs shown us for saving a number of men when there is time for launching a raft, or for saving individuals also in great number when Admiral Ryder's hammock is used. It is very strange that in this Institution we have models of every weapon for killing people, from the bow and arrow of the savage to the torpedo and the 600-pounder of this highly civilized age, but beyond the models here, there is not in the whole of this Institution any apparatus for saving life. I think it is a very extraordinary circumstance. I had hoped the discussion here might have found its way to the Admiralty. I believe, however, that there is no one here from that Department. I should like, however, to suggest to the Council, that a Committee should be formed to take this matter into consideration and bring it under the notice of the Admiralty. It is a most important subject, and I am very much obliged to all the gentlemen who have taken part in the discussion. I hope it may be productive of good.



The CHAIRMAN : It remains that I should ask you to give a vote of thanks to the reader of the paper, and also to those gentlemen who have been kind enough to show us their models, which are of the greatest interest.

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## APPENDIX.

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SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE,  
John Street, Adelphi, London, W.C.

### SAVING LIFE AT SEA.

#### GOLD MEDAL.

#### COMMITTEE.

T. Brassey, Esq., M.P. ; Donald Currie, Esq. ; Admiral Nolloth ; Admiral Sir Erasmus Ommanney, C.B., F.R.S. ; Capt. Price, R.N., M.P. ; Admiral A. P. Ryder ; Admiral Sir E. Sotheby ; Capt. Toynbee.

The Council of the Society of Arts offers its Gold Medal for the best means of saving life at sea, when a vessel has to be abandoned suddenly, say with only five minutes' warning ; the shore or other vessels being in sight.

1. Preference will be given to appliances to which fewest objections are established, on the score of their occupying valuable space, interfering with the stowage of more important articles, being in the way, being unsightly, not being ready at hand, requiring more or less "fitting" when brought into use.

2. Preference will be given to appliances to which fewest objections are established on the part of medical men, on the score of the appliances being unhealthy.

3. Preference will be given to appliances to which fewest objections are established on the part of seamen, on the score of their being uncomfortable, inconvenient, &c.

4. Preference will be given to appliances which afford a buoyancy of, at least, 40 lbs. to each person on board, whether of the crew or a passenger.

N.B.—The cork life-belt, usually supplied, has a weight of 5 lbs., and a buoyancy of 20 lbs. It will float a man of ordinary dimensions, with his shoulders just a-wash, provided all the rest of his body is under water. The life-belt placed in their boats by the Royal National Lifeboat Institution has a buoyancy of about 25 lbs., but only weighs 5 lbs., owing to the superior quality of the cork.

5. Preference will be given to means of flotation which utilize articles already existing on board, so that no extra space will be required.

6. Preference will be given to appliances that are the least expensive, as to first cost and annual repair.

7. Preference will be given to appliances best able to stand the variations of climate, rough treatment, &c.

8. Neither boats nor rafts will be admitted to the competition, as it is almost certain that in the contemplated cases of abandonment neither of them could be lowered or cleared away in time, and because, even if the boats stowed outside could be cleared away, there would rarely be sufficient space to provide means of safety for all the crew and passengers.

NOTE.—Of course, if there were time to clear away boats or rafts, they would be first attended to.

9. Cork belts, with a buoyancy of less than 40 lbs., will not be admissible, as it is most important that the mouth and nostrils of every one in the water be raised as far as possible above the surface. The ordinary life-belt, admirably suited for use in boats, and to support in the water persons accustomed to immersion in it, would frequently be quite insufficient in the cases contemplated for all non-swimmers, especially women and children.

10. No preparation of india-rubber or gutta-percha will be admissible, as with the

greatest precautions they are not sufficiently proof against the effects of climate and of ill-usage.

NOTE 1.—It is to be understood that, under the special circumstances of the cases contemplated, all that is aimed at is to preserve life until the shore is reached, or the immersed persons are picked up. For this reason no provision is expected to be made for food or water.

NOTE 2.—Competitors are at liberty to draw a distinction between appliances most suitable to men-of-war, to passenger ships, to ordinary merchant ships; also between the different circumstances attending a sudden abandonment by day and a sudden abandonment by night.

The Gold Medal will be awarded for the appliance, or combination of appliances, which answer in the highest degree the various qualifications named above; but the Council is at liberty to withhold the Medal if, in the opinion of the Judges, nothing is submitted worthy of the award.

Appliances intended for the competition must be sent in not later than the 31st October, 1878, addressed to the Secretary, Society of Arts, John Street, Adelphi, London, W.C., and must in every case be accompanied by a *short* description.

By order,

P. LE NEVE FOSTER, *Secretary*.

April, 1878.

NAMES OF MEMBERS who joined the Institution between the 1st July and the 30th September, 1878.

#### LIFE MEMBERS.

Cartwright, H. A., Lieut. 68th Regt.	Campbell, C. Walter, Capt. Bengal S. Corps.
Anson, Chas. V., Commander R.N.	Fogo, J. M. S., Dep. Surgeon-General, A.M.D.
Brookfield, A. M., Lieut. 13th Hussars.	
Chamberlain, Sir Neville B., G.C.B., G.C.S.I., Lieut.-General H.M.I.F.	

#### ANNUAL SUBSCRIBERS.

Elliott, G. H., Lieut. 3rd Ben. Cavalry.	Chater, Vernor, Capt. 91st Highlanders.
Alison, Sir A., Bart., K.C.B., Major-General.	Lloyd, T., Capt. late 87th Regt.
Holman, J. R., M.D., Fleet Surg. R.N.	Izat, Geo., Lieut. R.N.
Bourke, J. Mc. W., M.B., Surgeon-Major A.M.D.	Jackson, Hugh M., Lieut. R.E.
Stover, Henry, Colonel R.A.	Daniell, R. T., Surgeon 2nd Middlesex Art. Vols.
Essex, Edward, Capt. 75th Regt.	Guyon, H. J., Lieut. 102nd Regt.
McNalty, Geo. W., M.D., Surgeon-Major A.M.D.	Walker, A., Major R.A.
Du Vernet, F. T. C., Lieut. 56th Regt.	Shakespear, Geo. R. J., Capt. Bengal S. Corps.
	Coles, Walter, Lieut. R.E.



# OCCASIONAL PAPERS, NOTES,

AND

## NOTICES OF BOOKS.

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This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications, or books for review, may be addressed to

LIEUT.-COLONEL LONSDALE A. HALE,

Royal Engineers,

Royal United Service Institution,

Whitehall Yard, London, S.W.



## MUSKETRY INSTRUCTION AND LONG-RANGE INFANTRY FIRE IN AUSTRIA, FRANCE, AND PRUSSIA.

By Lieutenant WALTER H. JAMES, R.E.

MUCH attention has been lately given in England to the question of the best strength of the company, the modern tactical unit for infantry, and although such discussions are useful, both from a theoretical and practical point of view, still there has been, perhaps, too great a tendency to forget that although the form in which British infantry is to be brought against a future enemy is of great importance, the actual preparation of the *individual* soldier for the manifold requirements of the fighting of to-day is not less worthy of consideration. The drill formations may be excellent, but if the soldiers are not thoroughly imbued with the spirit of modern combat, do not feel thoroughly at home in the various phases of the fight, are not able in all circumstances to make the best use of their weapons, they will labour under a disadvantage when opposed to troops who have been educated to feel that a battle differs only from a sham-fight in the fact that the weapons of the enemy are pouring out deadly lead instead of harmless powder smoke; but that the confusion of combat, the rapid aiming which is necessary, the quick appreciation of distance, are familiar to them from their practice in peace.

From time to time various prophecies have been made as to the particular cause which will lead to success in the next great war. Now it is to the proper use of artillery, to the development of shrapnel fire, or the employment of mounted rifles. Such prophecies have often been realized, for they were but deductions from very obvious premises, and so we, taking into consideration the highly complex character of modern fighting, may now most confidently predict that the nation which first educates its troops in the true character of modern warfare, teaches them to do in peace what they have to do in war, and subordinates to that end the whole training of the soldier, will place itself in such a position that if it cannot exactly command success will at least have gone a long way on the road to it.

Now one of the most important parts of the training of the infantry soldier is the proper use of his weapon under the varying circumstances of the fight. The great military nations of Europe have latterly been paying much attention to this portion of the instruction of their infantry, and it has been thought that an analysis of the systems pursued in Austria-Hungary, France, and Prussia might not be without interest to the readers of the Journal.

Much will be found in the following pages that will be new to some of our readers, but we believe that a perusal of them will show that, while our system is on the whole sound, there are at least some points on which we may receive instruction from our neighbours.

Before proceeding to the systems of instruction, it may be well to describe the weapons with which the infantries of the three Powers are armed.

The Austro-Hungarian rifle, known as the Werndl, resembles some-



what in the outward form of its breech mechanism the Snider-Enfield. The Gras and the Mauser rifles,<sup>1</sup> the weapons respectively of France and Prussia, are bolt breech-loaders. The Werndl was introduced into the Austrian Army after the campaign of 1866, while the Gras and Mauser are the results of the war of 1870-71, and may be considered as representing the latest development of infantry arms.

The Werndl, in its original form, was somewhat behind the age; but by the introduction of the new cartridge with a heavier bullet and larger powder-charge, it has reached the first rank of weapons. Experiments have been for some time in progress in Austria with different forms of magazine weapons, but at present no decision appears to have been come to as to whether they should be introduced or not. The following table gives the principal dimensions of the above-mentioned arms:—

	Austria-Hungary.	France.	Prussia.
Weight of rifle without bayonet.....	9 lbs. 3 ozs.	9 lbs. 4 ozs.	9 lbs. 10 ozs.
"    "    with bayonet.....	10 lbs. 14 ozs.	10 lbs. 8 ozs.	11 lbs. 5 ozs.
Length of rifle without bayonet.....	4 ft. 2 ins.	4 ft. 3 ins.	4 ft. 5 ins.
"    "    with bayonet.....	5 ft. 9 ins.	5 ft. 11 ins.	6 ft. 0 ins.
Calibre across the lands.....	·421 ins.	·433 ins.	·433 ins.
Number of grooves.....	6	4	4
Inclination of grooves.....	1 turn in 28·74 ins.	1 turn in 21·66 ins.	1 turn in 21·66 ins.
Extreme graduation of sight.....	1,161 yds.	1,968 yds.	1,750 yds.
Weight of bullet.....	371 grs.	386 grs.	386 grs.
"    powder charge.....	77 grs.	81 grs.	77 grs.
"    cartridge complete.....	656 grs.	676 grs.	660 grs.
Muzzle velocity.....	1,437 ft.	1,430 ft.	1,410 ft.

The Werndl rifle is sighted from 200 to 1,400 paces (164 to 1,161 yards), and the sighting arrangements are similar to those employed with the Snider and Martini-Henry. There is, however, a peculiarity in the mode of employing the sight that is worthy of notice. As a rule the slide of the back sight is pushed so far up the sight that it rests on that step of the frame of the back sight, representing a range of 300 paces. This is called the standing sight (*stand visir*), and is to be always used for standing or moving objects up to a distance of 400 paces. When using it an infantry soldier would be struck in the upper part of the body up to a distance of 300 paces, in the lower between 300 and 400 paces. If small objects are to be fired at within 300 paces, as will often be the case in fighting in dispersed order, the slide of the back sight may be placed accordingly. The lowest position of the slide is for 200 paces, but as the trajectory is very flat it is not considered necessary to allow for the rise of the bullet when firing at objects within that range. When, however, it is necessary to hit a very small object in the centre, the soldier may aim—

<sup>1</sup> Specimens of the Werndl, Mauser, and Chassepôt (the mechanism of which is nearly the same as the Gras) are in the Royal United Service Institution Museum.

5 inches under the mark at an object 50 paces distant.

7	"	"	"	"	100	"	"
6	"	"	"	"	150	"	"

The construction of the back sight does not permit the slide to be placed for distances between 500 and 550 paces. With all other ranges between those for which the sight is graduated, the slide is to be placed between the graduations according to the judgment of the soldier.

The back sight of the Gras rifle is hinged the reverse way to that usually employed by us, and is in two parts, the one sliding up to the top of the other to give the extreme range, which is 1,800 metres (1,968 yards). It is graduated at 25-metre intervals, except from 1,200 to 1,400 metres, where the construction of the sight does not allow this to be done.

The following are the rules for the employment of the sight:—

Up to 250 metres the sight for 200 metres is to be used. Between 250 and 350 metres that for 300 metres. Between 350 and 400 metres that for 350 metres. Between 400 and 800 the back sight is to be adjusted to the nearest graduation.

The Mauser rifle presents several peculiarities in the method of sighting. In the first place there is a standing sight used for ranges up to 270 metres (300 yards *ca.*), a flap sight which can be used up to 360 metres (400 yards), and the ordinary back sight, which is in two parts, the one pulling up over the other, and which gives an extreme range of 1,600 metres (1,750 yards), with 50-metre divisions from 400 to 1,100 metres, and from 1,200 to 1,600 metres. The construction does not permit subdivisions in the graduations between 1,100 to 1,200 metres.

The various sights are employed as follows:—

*Standing sight*, against objects half the height of a man within 270 metres (300 yards), against recumbent objects or men's heads within 200 metres (219 yards).

*Flap sight* to fire at infantry standing in the open up to 350 metres (383 yards), or at broader objects half the height of a man from 270 to 350 metres (300 to 383 yards). Against cavalry, the back sight set for 400 metres is used from 350 to 400 metres, from 350 metres to muzzle, the flap sight is used.

When the back sight is used for 450 metres and over, the dangerous zone<sup>1</sup> extends but a short distance in front of the point of impact, and therefore great accuracy in judging distance is required. When the object aimed at lies towards the extremity of the range for which the back sight is adjusted, as, for example, an infantry soldier at 480 metres, or a cavalry soldier at 580 metres, it is better to set it for 500 and 600 metres respectively.

In Austria and France the men are taught to aim at the middle of the object fired at. In Prussia, however, the lowest point of the mark

<sup>1</sup> English military phraseology contains no expression equivalent to the German "bestrichener raum," or the French "zone dangereuse," *i.e.*, the distance covered by a shot in that portion of its trajectory not more than six feet above the surface of the ground. We have therefore ventured on the expression *dangerous zone*.

(*ziel aufsitzen*) is always to be aimed at; this method it is considered best fulfils the requirements of war, where the object is to hit as many men as possible in some one part of the body, and render them *hors de combat*, rather than to kill a few by hitting them in more vital parts. All three nations aim with a full sight.

The system of instruction differs considerably in all three Armies from that which obtains in England.

In Austria-Hungary the musketry instruction is carried out by the company Officers; but to every battalion is attached a subaltern Officer who has been through the School of Musketry at Brück, and whose duty it is to exercise a supervision over the instruction in both the theoretical and practical parts of the work. It is also his duty to draw the attention of the battalion commander to any departures from the authorised course. Each regiment is further provided with a Captain or Lieutenant, who is charged with the general superintendence of the course of instruction; but whose functions are not more definitely laid down in the official text-book.

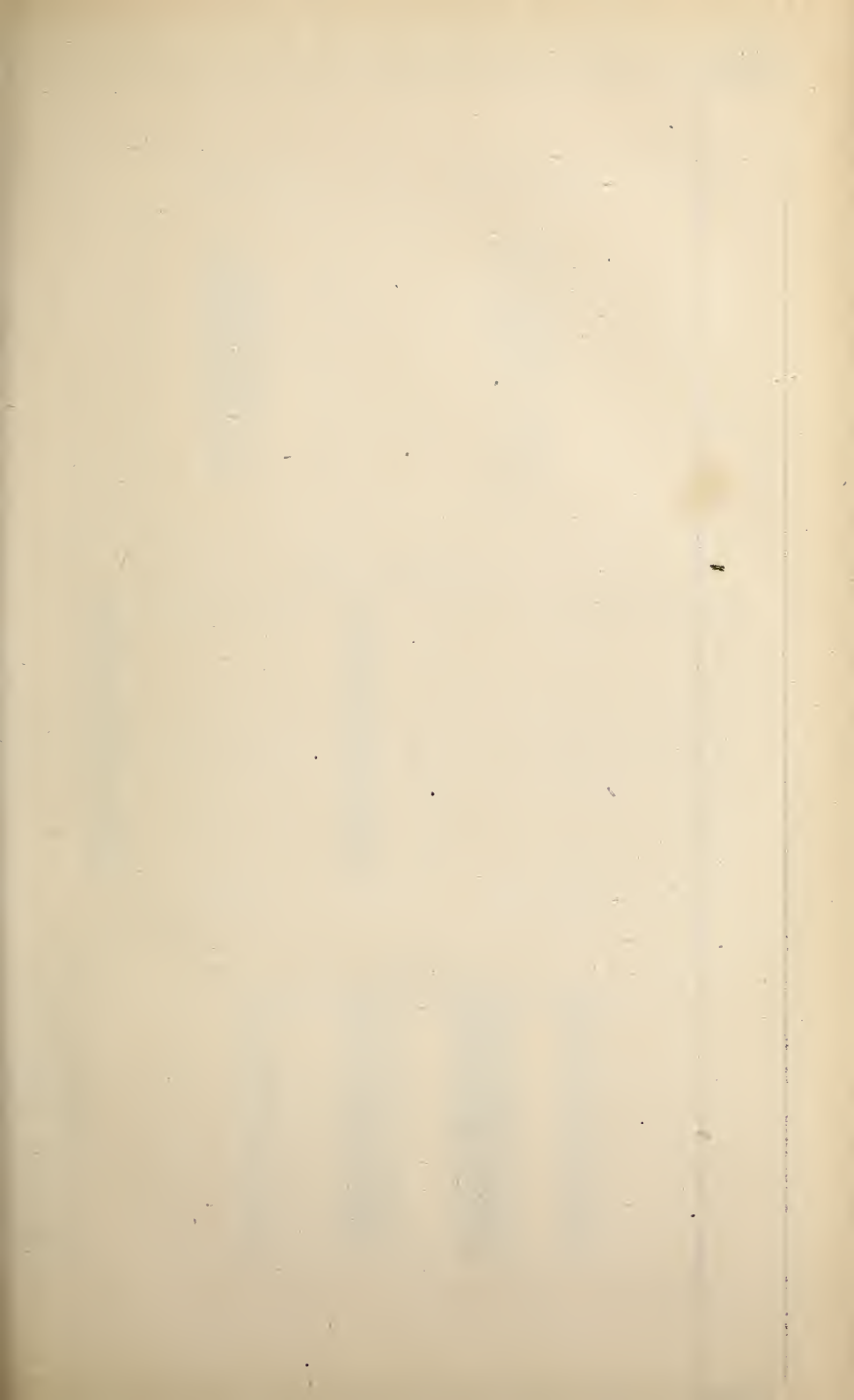
It is the duty of the commandants of battalions or regiments to ascertain personally, as well as by the reports of the musketry instructors, that the company commanders carry out the musketry instruction strictly in accordance with the regulations.

In France the system employed more nearly approaches that in use in England. Each regiment has a *Capitaine de Tir* (Captain-Instructor of Musketry) and each battalion a Lieutenant or Sub-Lieutenant, chosen from among those Officers of the regiment who have passed through one of the schools of musketry, Chalons, le Ruchard, la Valbonne, or Blidah, with success. They do not, however, appear to be supernumeraries. The musketry instruction of the regiment is placed under the supervision of the Colonel, the Lieutenant-Colonel arranging the details. The commanders of battalions and companies have the direction of and are responsible for the due instruction of the men. The Captain-Instructor has to be present with every company of the regiment when shooting, and the Lieutenant-Instructors have also to be present with the companies of their respective battalions. These Officers are further charged with the preparation and care of the ranges, targets, &c., and the keeping of the registers.

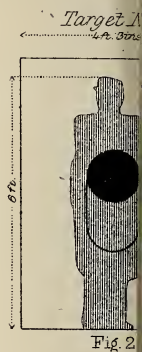
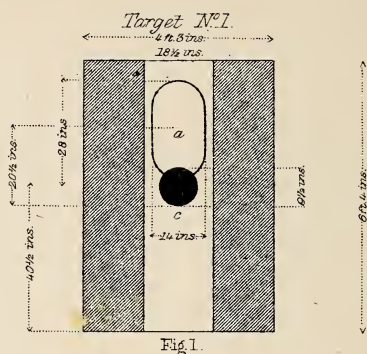
In Germany the musketry instruction is conducted entirely by the company Officers; but it is recommended that the experimental shooting (*Belehrungs-Schiessen*) and section shooting should be conducted under the superintendence of the regimental or battalion commander. The former because, being carried out with the spare ammunition of the companies, it is well that the whole of these should be collected together, in order that adequate instruction may be imparted to all with the necessarily small expenditure of ammunition, the latter in order to practise the Officers in fire discipline. For this reason, also, it is considered desirable that the squad shooting should be carried out with the various units as near war strength as possible.<sup>1</sup>

<sup>1</sup> Evidently by uniting two companies or *züge* on a peace strength to form one on a war footing.



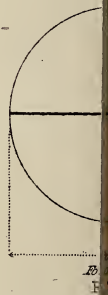
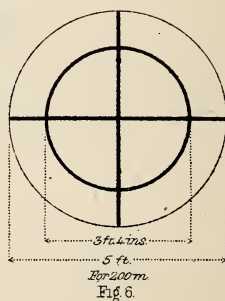
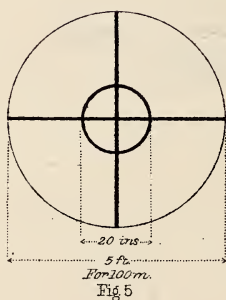


A U S T R I A

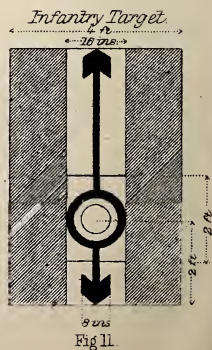
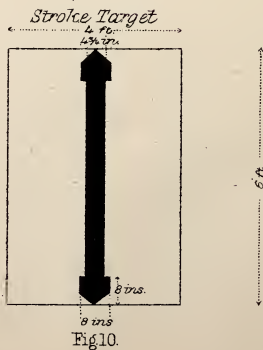


F R E N C H

*Round Target.*



P R U S S I A



The targets employed in Austria are of four kinds, viz. :—

1. Target No. 1 (Fig. 1).
2. Target No. 2 (Fig. 1).
3. Target No. 3 (Fig. 3).
4. Figure target (Fig. 4).
5. Group target.

*Target No. 1*, used for ranges up to 200 paces, is 6 feet 4 inches high by 4 feet 3 inches broad, divided into three portions vertically, the inner one,  $18\frac{1}{2}$  inches broad, being left white, and the two others coloured grey. The centre of the “aiming point” *c*, which is painted black, is  $40\frac{1}{2}$  inches from the bottom of the target, the point itself being  $9\frac{1}{2}$  inches in diameter. Aim is taken at the inferior margin of this point. The oval *a*, is 28 inches long and 14 inches broad, its centre being  $20\frac{1}{2}$  inches above the lower edge of the aiming point, the distance above the same that a bullet fired from the rifle at 150 paces with the so-called standing sight, *i.e.*, the back sight adjusted for 200 paces, would strike the target.

*Target No. 2* is used for ranges from 300 to 500 paces. It is the same height and breadth as target No. 1. The ground of target is white and the figure, which is 6 feet high, is painted grey. The aiming point is 14 inches in diameter, the oval of the same dimensions as in target No. 1. The lower edge of the aiming point passes through the centre of the oval, *i.e.*, the point aimed at is the centre of the oval, because at whatever range this target is used, the proper sight is employed.

*Target No. 3* is exactly like No. 2, except that there is no aiming point. It is used at a range of 300 paces.

The number of points allowed for a hit in the different portions of these targets is as follows:—In the grey portion of the target No. 1, or outside the figures in Nos. 2 and 3, two; in the white portion of No. 1, or in the figures of No. 2 and 3 targets, eight; in the ovals, ten. The aiming point is not taken into consideration in scoring, being used simply to define the point aimed at.

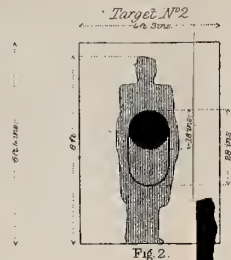
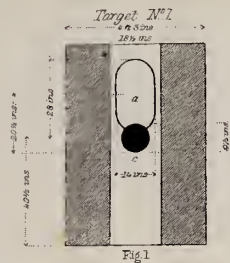
These targets are usually made to pull up and down, or to revolve, in which latter case two targets are arranged like the sails of a wind-mill, so that one at a time only is visible.

*The figure target* is a coloured representation of a soldier pasted on pasteboard, which is strengthened by a framework. The figure is about 6 feet high and every shot which strikes it counts ten. The figure is sometimes cut down to half, a third, or a fifth of its height to represent a kneeling man, or a man hidden by a shelter trench, &c., for which purpose, also, the head only is sometimes used. Besides the infantry figure target, one representing a cavalry soldier is also employed, and both are used as movable targets, similar to the running deer target.

*The group target* is used up to ranges of 600 paces and is 6 feet 4 inches high and 11 feet 10 inches broad, with a white ground, on which a number of figures, similar to the infantry figure target, are pasted side by side so as to represent a group. A number of No. 3 targets placed side by side may also be used as a group target.



# AUSTRIAN TARGETS

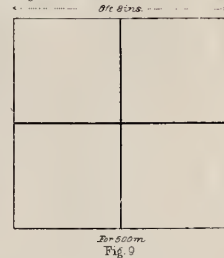
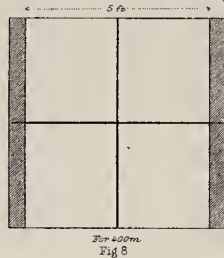


# FRENCH TARGETS

*Round Target*

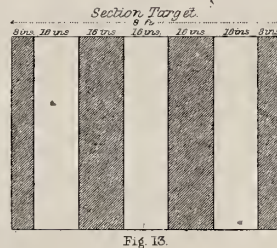
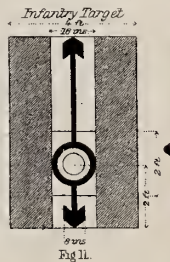


*Rectangular Targets*



# PRUSSIA

# TARGETS



The targets employed in Austria are of four kinds, viz. :—

1. Target No. 1 (Fig. 1).
2. Target No. 2 (Fig. 1).
3. Target No. 3 (Fig. 3).
4. Figure target (Fig. 4).
5. Group target.

*Target No. 1*, used for ranges up to 200 paces, is 6 feet 4 inches high by 4 feet 3 inches broad, divided into three portions vertically, the inner one,  $18\frac{1}{2}$  inches broad, being left white, and the two others coloured grey. The centre of the “aiming point” *c*, which is painted black, is  $40\frac{1}{2}$  inches from the bottom of the target, the point itself being  $9\frac{1}{2}$  inches in diameter. Aim is taken at the inferior margin of this point. The oval *a*, is 28 inches long and 14 inches broad, its centre being  $20\frac{1}{2}$  inches above the lower edge of the aiming point, the distance above the same that a bullet fired from the rifle at 150 paces with the so-called standing sight, *i.e.*, the back sight adjusted for 200 paces, would strike the target.

*Target No. 2* is used for ranges from 300 to 500 paces. It is the same height and breadth as target No. 1. The ground of target is white and the figure, which is 6 feet high, is painted grey. The aiming point is 14 inches in diameter, the oval of the same dimensions as in target No. 1. The lower edge of the aiming point passes through the centre of the oval, *i.e.*, the point aimed at is the centre of the oval, because at whatever range this target is used, the proper sight is employed.

*Target No. 3* is exactly like No. 2, except that there is no aiming point. It is used at a range of 300 paces.

The number of points allowed for a hit in the different portions of these targets is as follows :—In the grey portion of the target No. 1, or outside the figures in Nos. 2 and 3, two; in the white portion of No. 1, or in the figures of No. 2 and 3 targets, eight; in the ovals, ten. The aiming point is not taken into consideration in scoring, being used simply to define the point aimed at.

These targets are usually made to pull up and down, or to revolve, in which latter case two targets are arranged like the sails of a wind-mill, so that one at a time only is visible.

*The figure target* is a coloured representation of a soldier pasted on pasteboard, which is strengthened by a framework. The figure is about 6 feet high and every shot which strikes it counts ten. The figure is sometimes cut down to half, a third, or a fifth of its height to represent a kneeling man, or a man hidden by a shelter trench, &c., for which purpose, also, the head only is sometimes used. Besides the infantry figure target, one representing a cavalry soldier is also employed, and both are used as movable targets, similar to the running deer target.

*The group target* is used up to ranges of 600 paces and is 6 feet 4 inches high and 11 feet 10 inches broad, with a white ground, on which a number of figures, similar to the infantry figure target, are pasted side by side so as to represent a group. A number of No. 3 targets placed side by side may also be used as a group target.

For shooting at long ranges or for volley firing two of the above targets or six No. 3 targets placed side by side are employed.

The framework of the targets is either of wood or iron, and they may be covered with pasteboard or with linen covered with paper.

The markers' butt is usually sunk in the ground in a trench, 6 feet 8 inches deep, in front of the target, and is provided with a wooden hut covered with earth, on the side of the trench furthest from the target. If circumstances do not permit this arrangement, a simple traverse is used. To communicate between the firing party and the butt, a bell or telegraphic apparatus is used.

Two men are always employed as markers. The position and value of each shot is shown by means of wooden or tin discs, 6 to 12 inches in diameter, affixed to the end of long thin wooden poles. They are differently coloured on each side, viz., white and blue, red and black. The white side is used to indicate a miss, being held on that side of the target by which the bullet has passed. The red side shows a hit in the oval, the black in the figure or in central portion of target No. 1, while the blue is used to indicate the position of a shot hitting in the outer divisions of the same target. To indicate the position of a shot on the figure target, it is lowered and a white disc stuck in the target, by pressing a short stalk with which it is provided into the shot-hole, and the target is then raised to show the soldier.

After indicating a shot, the red disc is shown as a danger signal, while the shot-hole is being plugged, and in the case of a target which pulls up or down, or revolves, while the target is being changed.

It is recommended to have a red and white flag to use as a danger flag for the longer ranges, which one of the markers will carry before the other who leaves the butt to plug the target, retiring after him when this has been done.

The targets employed in France are:—

1. The round target (Figs. 5, 6, 7).
2. The rectangular target (Figs. 8, 9).
3. The small rectangular target.
4. Movable targets.

The first is employed for individual firing up to 300 metres, and is 5 feet in diameter.

*The rectangular targets* are 6 feet 8 inches high by 3 feet 4 inches wide. Two are placed side by side for ranges from 300 to 500 metres, three are used for 600, four for 800, and five for 1,000 metres.

*The small rectangular targets* are used to imitate lines of skirmishers, and are 20 inches broad and either 6 feet 8 inches or 30 inches high, according as they represent standing or kneeling men.

The form of the movable targets has not yet been fixed.

On the round target and also on the rectangular targets, vertical and horizontal axes are drawn in black, 2 inches wide. On the round target, when used at 100 metres, a circle is described, 20 inches in diameter; when used at 200 metres one of 40 inches diameter, the border of the circle being in either case 2 inches broad. The shot to count must hit within these circles. For 300 metres the round target



has no inner circle. When the rectangular targets are used at 400 metres, a border is drawn down the vertical edges, 10 inches wide, and all shot to count must strike the target within the borders, *i.e.*, in a space 5 feet wide by 6 feet 8 inches high. At 500 metres the entire surface of the targets counts and no borders are employed.

The framework of the targets is of iron, with a bevelled edge turned towards the shooter to prevent splinters flying back towards the markers. The targets are covered with canvas and white paper.

For signalling, three men are required as markers, with a corporal to superintend. To show a hit a flag of red, or half red half white calico is used, attached to the end of a staff 6 feet 8 inches long. If the flag is raised and kept steady it shows that a hit has been made, but outside the portion of the target which counts. If the flag be waved, it shows that the hit has fallen within the counting portion. If the shot has missed the flag is not raised. To stop the holes a staff 10 feet long is used, with a short arm at right angles to it at one end, which arm carries on the staff end of it an iron disc, colour not stated. The small round of paper used to cover the hole in the target is put over it by means of this staff, which serves at the same time by its disc to show the exact position of the hit.

The shelter provided for the markers is usually a trench 6 feet 8 inches deep in front of the butt, in which, on the side facing the target a wooden hut is provided, roofed in with earth, the exterior side of which must not be more than 5 feet from the foot of the target. One marker attends to the flag, another stops the holes, and the third prepares the paper for this purpose.

The targets in use in the Prussian Army differ very considerably from those employed in the British service. They are of four kinds, viz.:—

1. The stroke target (Fig. 10).
2. The infantry target (Fig. 11).
3. The figure target (Fig. 12).
4. The group target (Fig. 13).

*The stroke target* is 6 feet high by 4 feet wide, white in colour, and having down the centre a black band  $4\frac{3}{4}$  inches wide, terminated at its extremities by two arrow heads, which serve as aiming points.

*The infantry target* is also 6 feet high and 4 feet wide. It is divided into three equal parts vertically, the two outer being painted blue, while the inner one is left white.

From a point on the vertical axis 2 feet from the bottom of the target, with radii of 4, 6, and 8 inches respectively, three circles are described. The smaller of these forms "ring 3," and is marked by a black border about  $\frac{2}{5}$  inch wide. The annulus included between the circumferences of the circles described with the radii of 8 and 6 inches respectively, constitutes "ring 1," and is painted black. "Ring 2" is space between ring 1 and ring 3. The space included within the circumference of ring 1 is called the "looking-glass." Above and below it are drawn two black bands horizontally across the central third of the target each  $\frac{3}{8}$  inch broad, and with the exterior edges 1 foot distant from the centre of the looking-glass. The space thus included is called the "rectangle." A stroke similar to that on the stroke target,

but only about 2 inches wide, is drawn down the centre line of the infantry target; but is interrupted at the looking-glass.

When the standing sight is used, the target is placed with looking-glass nearest the ground. When flap sight is used, the target is reversed.

*The figure target* is 6 feet high and 16 inches wide, and bears on it the coloured portrait of a foot soldier. The "rectangle" on the figure target embraces the trunk of soldier's body, and is included within two lines parallel to the top edge, and distant 1 foot and 3 feet respectively from it. The upper fourth of the target is called the "head target," the upper third the "breast target," the upper half the "trunk target," and the two upper thirds the "knee target."<sup>1</sup>

*The section target* is 6 feet high and 8 feet broad. At either side a vertical band 8 inches broad is painted in blue, and the remaining portion of the target is divided vertically into five equal parts, of which the innermost and two outer ones are white and the other two blue.

The targets may be covered with either canvas or cardboard, but the framework is always to be of wood.

In addition to the above fixed targets it is customary to use two varieties of movable target, one in which the target, a figure target, is drawn from side to side, as in the case of the running deer at Wimbledon, at the rate of 120 paces in the minute; the other in which the target is made visible and invisible alternately. The period of visibility is not to exceed that required for twelve paces in quick time.

With regard to the method of marking, the Prussian manual gives but very little information. The signals used must be as simple as possible, and must be made more slowly as the distance increases, the position of each shot being clearly indicated on the target. Before commencing the course, the system of marking is to be practised, and it should also be frequently practised during the course.

If a shot hits—

- a. When the stroke target is used, the stroke;
- b. When the infantry target is used, the target, the white division, the rectangle, or the looking-glass;
- c. When figure targets are in use, the figure or any part of the equipment;
- d. When firing at the section target, the target.

The following must be signalled:—

- a. Stroke.
- b. Target, white division, rectangle, number of the ring. (If a shot strikes between two rings, that with the highest value is to be signalled.)
- c. Figure or rectangle.
- d. Target.

Ricochets are not counted.

When movable or disappearing targets are employed, the former is to be drawn into the middle of the course, and the latter made visible, in order to show the position of the hit.

<sup>1</sup> The figure of a cavalry soldier is also sometimes used.

To signal, a corporal and two men are required for each range, and they are to be changed every two hours.

The organization of the Austrian ranges presents only one point which requires notice, viz., that the men fire from a shed, butts being erected at the various ranges. The French manual gives no detailed information concerning the construction of the ranges. The Prussian instruction book lays down that for a battalion, a range for each of the following distances is required, viz., for 300, 400, and 600 metres. For a regiment of three battalions assembled in one place, two ranges for 600 metres, one for 400 metres, and six for 300 metres, are required. The general construction of these ranges differs in no important particulars from those in use in England, except that great stress is laid on the entire separation from one another of the markers' butts and targets when several of the latter have a common butt behind them, by means of banks of earth.

Having now given a general description of the ranges, targets, and the general method of carrying on the instruction, we will proceed to give a more detailed account of the system of teaching employed in the three Armies.

#### *Austria.*

It was formerly the custom in Austria to suspend the course of musketry instruction during the winter months; but a recent order directs it to be carried on throughout the whole year, so that every man may go through at least one. When the cold is very severe, neither Officers or men are to be kept longer than two hours on the range.

The course, for which 110 rounds of ball cartridge are allowed for Officers and men alike is divided into:—

1. Preliminary drill.
2. Judging-distance practice.
3. Class shooting.
4. Practice shooting.
5. Field firing.

The Officers receive the same instruction as the men, and especial stress is laid on their target practice which takes place once a week during the fine weather. The preliminary drill is of a similar character to that which obtains in England. The soldier is taught to aim, in the first instance, from a rest, the instructor testing the accuracy of his aim, and afterwards he practises independently. The object aimed at at first, is a small black circle of 1 to 2 inches diameter, later on, the proper targets are used at the regulation distances. It is also recommended to make the recruit aim at the eye of the instructor. Position drill is taught standing, sitting, kneeling, and lying down. Instruction is also given in aiming from behind trees, and in aiming at objects, moving sideways, or to or from the soldier. Aim is always taken with a full sight, and half way up the object fired at. In firing at moving objects the soldier is taught to aim, when the object fired at is moving at the ordinary marching pace:—

If 100 paces distant	1 foot	in front of it.
If 150	„	1½ feet in front of it.
If 200	„	2 „



If a cavalry soldier, moving at a gallop, is to be fired at, the soldier aims when he is 150 paces off 3 feet in front of the horse's chest; 300 paces off, 6 feet in front of the horse's chest.

Against objects which are moving to or from the soldier, the latter will aim as a rule at the mid-height as long as the distance permits the standing sight to be used. At longer ranges he will aim somewhat under or over the mid-height as the object is approaching to or retiring from him.

The recruit is taught to fire by a steady pressure of the trigger while holding his breath, and is instructed to keep the rifle at the "present" for three pauses of quick time after firing, and to observe the direction of rifle at that moment. In order to ensure a proper method of pulling the trigger, the instructor is recommended to lay his own forefinger on the soldier's, and to fire the rifle himself without the aid of the former.

Judging-distance practice is to be taught to the soldier, so that he may be able to judge as accurately as possible all distances within the range of his rifle at least up to 400 paces. Officers and non-commissioned officers must be able to judge distances up to 1,200 paces with accuracy.

At the commencement of the instruction, soldiers are to be placed at intervals of 100 paces, one behind the other, but so that all are visible from the point where those who are to be taught are drawn up. The attention of the soldiers is then drawn to the apparent length of the first hundred paces, and also the apparent decrease in each subsequent hundred paces due to its distance from the observer, and they are told to impress these appearances on their memories, with a view to applying them to judge ranges. They are further to observe the appearance of the men at the different distances, and to note what portions of their bodies and of their arms and equipment are visible at each.

When the soldier has made a certain amount of progress in judging distances on the flat, he is to be further instructed on rough and uneven ground, and to estimate the distances of soldiers partly behind cover and fully exposed. He is also to be taught how the period of the day, the nature of the lighting, and the various atmospheric influences affect the question. Thus objects seem nearer the better they are lighted, the larger they are, the lighter their colour, or the darker the background against which they stand, the purer the air, the more uniform the tint of the ground between them and the observer. On the other hand, they appear farther off when looking towards the sun, and *vice versa*. The clear cold air in winter or after a thunderstorm, makes objects seem nearer, while fog, powder-smoke, or the vapour caused by the heat of the sun, makes them look further off. A smooth expanse, as fields covered with snow, corn-fields, or water, has the effect of rendering the distance apparently shorter. Ground falling towards the object has the same effect, and the contrary when it rises.

The number of men forming a firing squad is not to exceed 15, under the command of an Officer or a non-commissioned officer, with a bugler or drummer.

After having posted the look-out sentries, and seeing that the targets

and markers' butts are in proper order, the arms are to be inspected. The bugler will then sound the call "Commence firing," or the drummer give a "complete roll" (*ganze ruf*, i.e., a roll of a certain length), and the markers retire behind the traverse or into the hut, removing the signalling disc, which hitherto should have been placed against the target with its red side outwards.

The name of the first man is then read out by the Officer or non-commissioned officer in charge of the squad from the previously prepared register with which he is provided. The man named steps to the front with his rifle at the short trail or shouldered, loads, taking care to keep the muzzle towards the target, aims, and fires. If he finds any difficulty in aiming he comes down from the present, rests a moment or two, and then aims again.

While the man has his rifle at the present he is not to be corrected or disturbed in any way. In the case of beginners or untrained men, they may be ordered to come down to the loading position, and then their faults shortly pointed out to them.

After firing, the man extracts the cartridge-case and comes down to the shoulder or short trail, calling out at the same time where he thinks he has hit the target, and then waits till the shot is signalled. In case the men find any difficulty in doing this, it is recommended that the Officer or non-commissioned officer in charge of the party should have a plan of the target in use drawn out on paper, on which each soldier can point out the place where he believes his shot has struck.

When the shot is signalled any remarks on it which are necessary are to be made, and the soldier then falls back, and places his rifle against the rack, after seeing that his shot is properly registered.

Where the butts are not provided with markers' trenches, but only with traverses, the next man is not to be called to the front until the markers on the range concerned, and any neighbouring ones, have retired behind the traverses.

After each shot has been fired, the marker is to be informed by means of the telegraph or bell, or, where these do not exist, by a single note on the bugle or a short roll on the drum. If the value of the shot is to be re-indicated, that one of these signals which is in use must be given again.

After each soldier has fired five shots, the total value of them is to be carried out on the register. When firing at the disappearing or movable target, the soldier is not to load till the signal has been given to the marker to make the target visible.

To facilitate the observation of the direction of the wind, a flag should always be put up in a suitable position before the firing commences.

When the practice is concluded the arms must be inspected before marching the party off, to see that no rifles are loaded.

Empty cartridge-cases are to be allowed to fall on the ground when extracted, and are to be picked up by men told off for this purpose and to attend to the marker's bell or telegraph. On no account are they to be placed in the pouches, where they would be likely to damage the other cartridges.

The *class shooting* is conducted as follows, the position being standing.

The 3rd class embraces those soldiers who shoot for the first time, or those who in previous courses have not obtained a score entitling them to be placed in the 2nd class.

The 3rd class course commences with the target No. 1 at 150 paces (125 yards). As soon as the soldier in a series of five consecutive shots has scored 30, the range is increased to 200 paces (166 yards), and when he has, under like conditions, again scored 30, he shoots at targets No. 2 and No. 3 at 300 paces (250 yards). When he has in the same manner scored 30 at 300 paces with No. 3 target he is transferred to the 2nd class. The practice of the 2nd class shots is carried on at 400 paces (333 yards) against No. 2 target. When the soldier has in two consecutive series of five shots scored 30 in each series, he is promoted to the 1st class.

First class shots, called marksmen (*schützen*), have no course of class shooting. Of the 110 cartridges allowed annually for each soldier, the 2nd and 3rd class shots use 70 for the class shooting.

*Practice shooting.*—Third class shots do not go through this course unless they have arrived at shooting at No. 2 target at 300 paces without expending more than 70 cartridges. When this has been done they use 10 cartridges, firing in the different positions likely to be made use of in war at the whole-figure target (the Rifle battalions using also the half-figure target) at 150 and 200 paces. The back sight is set for 300 paces for the whole-figure, and for 200 for half-figure target.

Second class shots use 10 cartridges in firing at 200 paces at the whole-figure target, and at the half- (in the case of the Rifle battalions the one-third-) figure target at 150 or 200 paces. The back sight is set as above described for the 3rd class shots.

Seventy cartridges are employed by the marksmen in practice shooting. They fire five shots at the whole-figure target at 200 and 300 paces, and again at the disappearing target<sup>1</sup> at 200 paces. At the one-third and one-fifth figure targets at 150 and 200 paces, and at the head target at 150 paces. At the moving whole-figure target up to 200 paces, and the moving cavalry soldier target up to 300 paces. At No. 2 target up to 500 paces, and at the group target from 600 to 1,200 paces.

When shooting at the one-fifth figure target the back sight is to be set for 200 paces, and when aiming at 150 paces, the lower edge of the target is to be aimed at. When shooting at the head target the aim is to be taken half the height of the head below the target.

Those soldiers who, in the course of the class shooting, have reached the 1st or marksmen's class, are to be put through the course of practice shooting laid down for the 2nd class; any spare ammunition they may have over from the class shooting, through becoming marksmen without expending the allotted seventy rounds, will be used by them in practice shooting under the conditions laid down for their class.

*Field Firing.*—This portion of the musketry instruction is divided

<sup>1</sup> See page 917.



into two parts, called respectively, "shooting by classes" (*klassenweise-schiessen*) and "united practice" (*gesammtübung*).

The shooting by classes is intended to instruct the soldier in the proper way to use his weapon in the modern shooting line. For this purpose the men are practised in all the incidents of a fire fight, advancing and retiring, for the 3rd class shots, up to 300 paces; for the 2nd class, up to 400 paces; and, for the 1st class, up to 600 paces.

The targets used are a section target, 12 feet 8 inches wide (see *ante*, p. 897), in addition to which a few figure targets are placed in front and at the side of it. The latter are whole targets for the 3rd class, half targets for 2nd class, whole, half, and one-third figure targets for the 1st class. Fifteen cartridges are allowed for this portion of the course, and it is recommended that they should not be expended all on one occasion, but should be spread over several. Further, great stress is laid on making it as real as possible. Every kind of ground should be made use of and, if possible, some of the targets should be arranged to appear and disappear.

The united practice is similar in character, but all three classes are united for it. It embraces the carrying out of an action, by a shooting line, advancing and retiring up to 600 paces (500 yards), for which five rounds are allowed, and further, the delivery of volleys and independent firing, from closed bodies up to distances of 400 paces (334 yards) for which ten rounds are allowed. The targets employed are the same as in the shooting by classes, except that the section target is 25 feet 4 inches wide. As a rule, it is laid down that the marksmen should open fire first, at the longer distances, and should aim at the smallest targets.

When ammunition is available, and circumstances permit, it is recommended to carry out this part of the course with bodies of troops on a war strength, up to that of a battalion, if possible, and under all the conditions of actual warfare, of which some simple "special idea" should form the basis.

With regard to uniform for class shooting, it is laid down that "the greatest possible comfort in attire should be permitted," but for practice shooting and field firing, the soldier should be in service order.

As a distinctive mark, the marksmen wear a scarlet (grass green for riflemen) breast-knot on the left breast. Besides this, prizes are given to those who make the best scores in the annual competition laid down for them. For this purpose the 1st class shots of one or several companies shoot together, at a No. 2 target at 400 paces, a series or, if possible, two series of five shots, the prizes being given to those who make the best scores. No details are given as to the nature of the prizes. The soldiers of the 2nd and 3rd classes have to be present at this competition.

No special report is made to the authorities on the course of musketry instruction, but, at the end of every year, the average results of the various portions of the course are struck, and these serve, if necessary, as a means of comparison between regiments, and show, at the same time, what progress has been made.

*France.*

The system of musketry instruction in France differs a good deal from that employed in Austria. The general principles on which it is carried out have already been described, and we will now proceed to give a short sketch of the manner in which the instruction is imparted.

To ensure proper knowledge on the part of the subaltern Officers, the non-commissioned officers, and corporals, a regimental school of instruction is organized annually, during the last three months of the year. The course includes a thorough knowledge of the "*Manuel de l'Instructeur de Tir*," of the method of preserving and cleaning the arms, numerous exercises in judging distances, with the theoretical and practical application of all the different methods of doing this.

The lectures are given to the subaltern Officers by the Captain-Instructor and the battalion instructors to the non-commissioned officers and corporals of their respective battalions. At the termination of the course, the Colonel of the regiment, assisted by the Lieutenant-Colonel and the Majors commanding battalions, examines those who have been through the course. He dispenses with the future attendance of those Officers who show a complete theoretical and practical acquaintance with the subject, setting them instead every year, a subject for an essay bearing on the question of musketry instruction, taking care that it is of a practical or novel character. He will also give the preference for promotion to those non-commissioned officers and corporals who make themselves conspicuous by their zeal or their aptitude for instructing.

The inspecting General will further complete this measure by striking out from the promotion lists the names of all who are not in possession of musketry certificates. These are to be obtained in accordance with the instructions laid down annually by the Minister of War.

Great stress is laid in the manual on the necessity of being a good judge of distance. The soldier ought to be able to estimate the distance of the enemy up to 800 metres (875 yards); the Officer should be able, with the aid of a field-glass, to do so up to 1,000 or 1,200 metres (1,093 or 1,312 yards).

The method of instructing in judging distance is as follows:—The soldier is first to be taught the relation between his ordinary pace and the metre. To do this it is recommended that a length of 100 metres should be laid down in the barrack yard or other convenient place, subdivided into spaces of 10 metres, or having at least one such division marked, and that the men should be frequently made to pace it to ascertain the relationship between their pace and the metre for themselves, both for the whole distance and for the length of 10 metres. The exactitude of this system will then be impressed on the soldier by frequent measurements on other ground.

Being thus able to measure distances by pacing, he will now be taught to do so by sight. For this purpose, men are posted in couples, at 200, 300, 400, and 500 metres. One of them remains steady while the other, standing about 5 paces from him, goes through the usual motions of a man skirmishing before the enemy.

The Instructor then draws attention to the different parts of a soldier's uniform and equipment visible at the various distances, and teaches them to make these observations for themselves, and also as to what portions of the body are clearly distinguishable at the different ranges. They are also to be taught that the height of the foresight, above its base, covers, when the rifle is at the present, half the height of a soldier at 200 metres, and his total height at 400 metres.

When the whole squad understands the above rules, the Instructor will send a man in a different direction, and the men will then be told to estimate the distance, and each man will set his sight at what he estimates to be the proper range. The actual distance will then be measured by pacing, and when it has been ascertained, the Instructor will communicate to the men the elevation that should have been used. Beyond 600 metres (700 yards) it is necessary to send out the men by fours, as the difficulty of estimating the range at such distances from the appearance of one man only is very great.

Judging-distance practice is to be carried out over all kinds of ground, in all weathers and at all times of the year, and it is to be carefully impressed on the men how useless the fire of an individual man is, unless he is capable of estimating correctly the distance which separates him from the object aimed at.

The commanders of battalions are to instruct their Officers in judging distances up to 1,000 or 1,200 metres (1,093 or 1,312 yards) with the aid of field-glasses. When marching out, the opportunity is to be taken advantage of for practising this portion of the course. A few men may be sent out to fire blank cartridges to permit the estimation of distance by means of acoustic telemeters, such as that of Le Boulangé and others.

In the field, distances may be estimated by preliminary volleys, by telemeters, or may be got from maps or from the artillery if any be near at hand. It is better to use too little than too much elevation, and in settling what height of back sight is to be employed, the state of the weather must be taken into consideration. When on the defensive, if time permit, the distance of all important points should be ascertained and marked with cairns of stones, bunches of straw, or other simple means, taking care to arrange them so that they will not benefit the enemy.

The course of instruction exclusive of judging distance is divided into—

1. Aiming drill.
2. Position drill.
3. Target practice.

*Aiming drill* is taught on the same lines as with us.

The man commences by aiming his rifle placed on a sandbag on a tripod at a mark  $\frac{3}{4}$  inch in diameter about 11 yards off. He aims with a full sight so that the top of the fore sight just touches the bottom of the circle. The rifle is at first aimed by the instructor, the men forming the squad looking along it in succession to see how it is done, and afterwards they are taught to aim themselves.

To show graphically to the men how easy it is to make mistakes in



aiming, the following exercise is next to be carried out. A rifle is placed on a sandbag rest and directed at a large piece of paper pasted on a board or at a target without aiming point. A man is provided with a small disc of iron  $\frac{3}{4}$  inch in diameter at the end of a long wire, which he moves about the target till the man who is aiming, and who directs his movements, thinks it is in the line of sight. When this is the case he calls out "mark," and the instructor then marks the point aimed at by making a dot on the target by passing a pencil through a hole made in the centre of the disc for the purpose. The operation is repeated three times and the resulting three dots joined so as to form a triangle, which may be called the triangle of error of the particular individual.

When this has been done for one man the rifle is directed on another part of the target and the process is gone through again by another, and so on.

The next step is aiming with the sight set for 200, 300, and 350 metres, and the explanation of the graduations up to the extreme limit, 1,800 metres. The soldiers are also to be taught to make the necessary allowances for wind, or for any permanent deviation peculiar to their own particular weapons.

After this, the relative position of the line of fire and the line of sight is shown to the men by removing the breech-block, with a view to their understanding the part played by the back sight in aiming at the different ranges.

Position drill is then commenced. The man is taught to bring his rifle up properly, the instructor placing it in his shoulder. When this has been done the man himself brings his rifle to the present without aid, aiming at the same time. He is taught always to aim with the top of the fore sight part touching the bottom of the object aimed at, at the belt when firing at a man standing, or the bottom of the circle forming the aiming point on a target.

The man aims with the sight set for different ranges between 300 and 600 metres first of all, and afterwards for those over that range.

Part of the aiming is to be at the eye of the instructor so that he may be able to point out any errors.

When the men have learnt to aim standing, they are taught to do so kneeling and lying down.

The next step is to teach them to fire properly. This is done at first without cartridges, and then with blank cartridges before the target practice is commenced.

The man is taught, as far as possible, to note the point he was aiming at when he fired.

A common fault in firing is to move the shoulder at the moment of pulling the trigger. This can be ascertained by mingling with the ball cartridges supplied to the suspected man, one or two from which the powder has been removed.

*Target practice* is divided as shown in the table given below, which also shows the number of cartridges allowed and the manner of expending them.

No. of Practice.	Range.	Nature of the Practice.	No. of cartridges.			Remarks.
			Blank	Ball.		
1	100 m. (110 yds.) ...	Preliminary drill ... ..	6			
2 and 3	200 m. (220 yds.) ...	Individual firing ... ..	...	6		
		" " one standing, one kneeling ... ..	...	12		
4 and 5	300 m. (330 yds.) ...	" " " " " " " " " " " "	...	12		
6 and 7	400 m. (440 yds.) ...	" " one standing, one lying down ... ..	...	12		
8	500 m. (550 yds.) ...	" " kneeling ... ..	...	6		
9	600 m. (660 yds.) ...	" " " or lying down ... ..	...	6		
10	200 m. (220 yds.) ...	" " " " " " " " " "	...	6		
11	800 m. (880 yds.) ...	Lying down ... ..	...			
12	1,000 m. (1,100 yds.) ...	Kneeling ... ..	...			
13	To be fixed by the Colonel.	Kneeling at a moving target ... ..	...			
				10	10	B For 1st class only.
11	} Short distances to be fixed by the Colonel. {	Lying down ... ..	...			
12		Standing ... ..	...			
13		Lying down or kneeling ... ..	...			
				10	10	A For 3rd class only.
14	...	Skirmishing ... ..	...	10	10	
15	} To be fixed by the Colonel. {	Squad volleys, commanded by a corporal ... ..	2	5		
16		Volleys in half-sections, commanded by a sergeant ... ..	2	5		
17		Volleys in sections, commanded by a section-leader ... ..	4	10		
18		Company independent firing, commanded by the Captain ... ..	3	5		
19		Volleys by companies, commanded by the Captain ... ..	3	5		
			20			

The musketry instructors place the targets, which must be put at intervals from one another, equal to at least twice their breadth. They are responsible for the general security and order on the range. They must also ascertain any corrections that the wind or weather may necessitate in aiming, by shooting with a rifle of a perfectly normal character before the men commence their practice.

Before the firing begins, the musketry instructor will order a drummer to beat a roll, or the trumpeter to sound the "alarm." The markers then wave their flags to show they hear it. When the signal "commence firing" is given on the drum or trumpet, the markers lower their flags. To stop firing, the "cease fire" is sounded or a roll given on the drum. The markers will then raise their flags. When the signal "rise" is given, the markers may leave their butts and not before. When the ranges are not sufficiently long to permit the whole of the practices laid down for individual firing to be carried out, the series will begin again from the beginning as often as may be necessary to expend the sixty cartridges.

When independent firing or volleys cannot be practised, the cartridges allowed will be expended in individual firing.

If a man has been absent from more than one of the individual firing practices, he will begin the series again from the commencement.

At the ranges the men will be divided into sections or half sections according to the number of the targets.

The section which is about to fire is drawn up ten paces from the firing point, those waiting their turn twenty paces to the rear. The markers, who are not to mark for their own companies, are to be chosen from the waiting sections.

The non-commissioned officers fire first and then the men, beginning from the right of the squad. Each man advances, makes ready, and fires. He discharges his six cartridges one after another, calling out the result of each shot after it has been signalled. After he has finished, he retires by the left flank and falls in five paces in rear of the right flank of the section.

The other men follow in succession.

A non-commissioned officer is posted close to the firing point, whose duty it is to keep the shooting register and see that the man fires properly.

Each time that a hit which counts is signalled, the drummer gives one tap on the drum, or the trumpeter one note on the trumpet.

Although ricochets count, still when the instructor observes that one has been made, he should point out, if possible, the cause of this error to the man shooting.

The execution of *skirmishing fire* takes the place with the French of the field firing of the Austrians and Germans, for which purposes, says the "Manuel," "it should be executed under circumstances resembling reality as much as possible."

The targets should represent a skirmishing line with supports and reserves also if possible. The skirmishing line is represented by the small rectangular targets placed 7 feet 6 inches from centre to centre. The supports, 150 metres (165 yards) in rear of the former, will be represented by two targets, each of which is to 27 feet 8 inches wide,<sup>1</sup> placed side by side or separated. Nothing is laid down with regard to the targets for the reserves, it being but very rarely that these can be employed owing to want of space and the necessary materials.

The ranges will always be unknown to the men. The usual manner of carrying out this part of the course will be to extend the company at 700 to 800 metres (770 to 880 yards) from the first line of targets, towards which the men will then advance, and retire firing between 600 and 400 metres (660 and 440 yards).

All ranges are not suited for this particular exercise as here laid down. It must then be modified according to circumstances; keeping always in mind its object to represent the various phases of an infantry fight.

In *volley firing* the squad is formed in single rank. All the other formations are in two ranks.

The ball firing is preceded by the regulation number (see table, p. 909) of rounds of blank cartridge. Stress is laid on the volley being given together. The Officers or non-commissioned officers in charge are to be careful not to delay too long or to hurry the time between "present" and "fire." They determine also the elevation to be used,

<sup>1</sup> The height is not given.



the volleys being always delivered at unknown distances. In the *independent firing*, practice No. 18, care must be taken that the men adjust the back sights as ordered, that they aim properly and do not fire too quickly. The same targets are used for this and volley firing as for skirmishing.

The men are divided into three classes according to the results of the individual firing. Those who have struck the targets thirty times to count, form the 1st class, those who have hit twelve times, the 2nd class. The 3rd class embraces the rest of the men. Men who have not completed their course by one or two practices, are classed according to their scores.

After going through the course as described, the 3rd class shots are put through the course marked B in the table, the 1st class shots through that marked A. The 2nd class shots are again put through the preliminary instruction and fire at short distances.

With reference to the further instruction of the 1st class shots, it should, if possible, include practice in plunging fire. This can only be carried out at a range of 800 metres (880 yards) and over. The slide of the back sight should be set one millimetre ( $\cdot 039$  inch) above the proper height to ensure the projectile clearing the crest of the object behind which it is desired to obtain effect.

The ammunition for this purpose is to be obtained from the surplus arising from men not going through the whole of the course.

In aiming at moving objects, the soldier should be taught that to hit a cavalry man moving at the walk, trot, or gallop, at a range of 600 metres (660 yards) it is necessary to aim 3, 7, or 11 metres (10, 23, or 36 feet) in front of the horse.

Nothing is laid down as to the dress to be worn at any part of the course.

After the annual musketry course is finished, competitions take place between—

1. The non-commissioned officers.
2. The ten best shots, corporals or soldiers, of the several companies, determined by the individual shooting.
3. The companies.

The first two take place at 200 metres (220 yards) against the round target. Six rounds are fired by each man excluding three sighting shots if he likes to have them, and the mean deviation of the six from the centre of the target is measured, the man who makes the smallest string winning. Ties fire a seventh shot to decide.

For the companies the target used is plain white, 13 feet 4 inches long by 6 feet 8 inches high. It is placed at 600 metres range (660 yards) if possible, if not at as long a range as it can be.

Six rounds are fired in volleys, the total time taken being noted and the figure of merit calculated by the useful effect, which is calculated thus: If 128 hits have been made by 85 men in 78 seconds, the useful effect, *i.e.*, the number of hits that would have been at that rate and accuracy in one minute by 100 men, is  $\frac{128 \times 60 \times 100}{85 \times 78} = 116$

nearly.

As badges for the corporals and men, a grenade in gold, to be worn as a decoration, and fifty-four badges (French horns) in yellow cloth are given to each regiment annually. Each independent battalion receives a grenade and fifteen badges. For the non-commissioned officers, a grenade and nine badges in gold are given to each regiment, and a grenade and three badges to each independent battalion. Men who obtain a cloth badge two years running have it changed into one in gold, provided they are in the first half of those who receive badges. First class shots who win a golden badge are called marksmen (*tireurs d'élite*). They do not take part in the annual competitions unless the result of the individual firing place them among the first ten. If they then again win a badge it is noted in their pocket books; but the badge is given to the next on the list.

The twenty best shots of each regiment including these non-commissioned officers receive a certain amount of furlough, determined each year by the War Minister, provided they are not otherwise undeserving of it. From each independent battalion six men including one non-commissioned officer receive like furloughs.

For the information of the War Minister a report on the musketry instruction of each regiment is rendered annually.

It is divided into three parts, the first two of which are compiled by the Colonel of the regiments, the third containing the remarks of the General Officers commanding brigades and divisions on the first two.

The first part deals with the organization and results of the regimental school of instruction, gives the names of the instructors of musketry and reports on their zeal and qualifications, and also opinion of the Colonel as to the methods of instruction and the results obtained, &c. The second part contains detailed information as to the result of the individual, volley, and skirmishing firing, with explanatory notes when necessary. The report must be despatched before the 15th January of each year.

#### *Prussia.*

The course of musketry instruction in Prussia presents many points of difference as compared with those of the other two countries, some of which are specially worthy of remark.

As has been previously stated, the instruction of the men is placed almost entirely in the hands of the Captains of companies, the junior Officers of course assisting. To ensure that the company Officers have a proper acquaintance with their work, the regimental and battalion commanders are ordered to make themselves thoroughly acquainted with their attainments, and the company chiefs are to bestow similar attention with regard to the knowledge possessed by the non-commissioned officers under their command. Those engaged in instructing the men are to practise with each other in order to keep up their knowledge and power of teaching. The Captains and Subalterns of each battalion or regiment are, if possible, united each year to go through a course of class shooting, under one of the senior Officers told off for this duty, in which they have to fulfil the same conditions as the men. Any Officers who may belong to the regiment, but who are detached

from it for staff duty in the same garrison, are to be recalled for this purpose.

The whole of the non-commissioned officers go through the course of rifle shooting with their respective companies.

The course may be divided into—

1. Preliminary drill in position and aiming.
2. Class shooting.
3. Field firing.
4. Instruction practice.

The recruit is to have a rifle placed in his hands as soon after he joins as possible in order that he may get quickly accustomed to it. His instruction in its use commences with aiming drill. For this purpose the rifle is placed on a sand bag or in an aiming apparatus<sup>1</sup> (*ziel machine*), and aimed by the instructor. The man then looks along the rifle, and sees how the aim is taken with reference to the sights, &c.; and when he understands how this is done, he aims himself at first from some rest, as above described, afterwards without support. The various errors which may be made by the man such as inclining the sights to one side, not having the fore sight in the centre of the notch, taking too fine or too full a sight, not having the fore sight in the centre of the notch of the back sight, &c., are to be duly pointed out. At the same time, the man is taught to grasp the small of the butt properly so as to be able to pull off the trigger in the right manner. The proper method will be shown to him by the instructor placing his own finger on the man's, and pulling the trigger.

Position drill is to go on simultaneously with aiming drill. It is carried out on the same principles as in England.

When sufficient progress has been gained in position and aiming drill separately they are to be combined, and the man taught to aim properly in the proper position. For this purpose a rest is at first employed. No definite pattern is laid down in the regulations; but a good one is said to be that of an inclined table with steps on which the elbow can be rested. In using this apparatus care is to be taken that the rifle only rests lightly on the table, and that the proper position of the body is not departed from.

When the recruit has been sufficiently taught by this method he will be practised in aiming without a rest in the various positions, such as kneeling, sitting, lying down, behind a tree, &c., and also at moving objects. He is not to be allowed to begin ball practice until he has made sufficient progress in the preliminary drill.

Before firing with ball cartridge, of which 130 rounds are allowed annually for every company Officer, non-commissioned officer, and private, and 50 rounds for each Field Officer, the soldier is to be practised with blank cartridge, 30 rounds of which are allowed per man annually. The rest is to be employed, and aim always taken at a target.

A very common error in shooting is closing the eyes while firing. To prevent this it is recommended to hand occasionally to the man an

<sup>1</sup> No information is given in the instruction book as to how the sand bag is supported, or what the nature of the aiming apparatus is.



unloaded rifle, so that he may be in ignorance as to whether there will be a recoil or not. This should be done not only during the practice with blank cartridge, but also during the target practice.

When ball firing is begun particular care is to be paid to the attitude of the soldier. If the instructor sees that he is aiming badly or that his position is not right, he is at once to correct him before the shot is fired. Such corrections should, however, be quickly and quietly done, so as not to fatigue the man by keeping him too long at the present.

If the man is unsteady in aiming, he is to be ordered to come down from the present and rest for a few moments. If the unsteadiness continues his practice may be deferred to a future day, or he may be put back to a shorter range by the special order of the company chief.

After firing, the weapon is to be kept at the present for a short pause, and then brought down in the man's own time, and the latter is then to state the point at which he was aiming at the moment of firing.

If a bad shot is made the instructor is to point out, as far as possible, the reason of it.

In aiming at moving objects the left hand alone is to be used to move the rifle. The more distant the object is, or the farther it is off, the farther in front of it must the aim be taken. Thus, in the case of the drawing target, if this be moving in ordinary quick time at 100 metres distance, the aim must be taken 8 inches in front, if the range be 150 metres, 24 inches in front of it.

To make proper use of the rifle in the field, it is necessary that the men should be able to aim quickly, choose the proper point to aim at with reference to the field of fire, and make proper use of natural objects to support the rifle and to give them cover from the enemy. Further, it is needful to be able to judge distances quickly and accurately in order to arrange the back sight properly. To keep up the requisite amount of skill in all these branches of the art of shooting they must be frequently practised during the whole period of the soldier's service.

The target practice is to be conducted in easy dress,<sup>1</sup> so far as the preliminary practice of each class is concerned. The main practice, however (*Haupt Uebung*), is to be carried out in marching order with knapsacks packed. In order to accustom him to the different movements of the rifle in marching order, it is laid down that position drill should be practised by him when fully equipped, and before he commences the course of ball practice or field firing.

The men, when going through the class shooting, are not to be tired out by long marches to and from the range, or by fatiguing work beforehand. They are not, as a rule, to fire more than ten or less than five shots at one practice.

If during the course it is discovered that certain men are short sighted, their instruction may be limited to those ranges at which their sight permits them to shoot with effect.

When a man fails in twenty consecutive shots, whether fired on the same or on more than one day, to hit the target four times, he is to be put back to the next shortest range, and especial attention given to him.

<sup>1</sup> *Bequemer anzug*, with belt, one pouch, and forage cap, equivalent to drill order.

If it appears in the course of ball practice that certain men are not likely to improve in their shooting, and that therefore a continued expenditure of ammunition by them would be waste, they may be at the discretion of the battalion commander excluded from taking any further part in the course.

The use of tents or other means of shelter for the men on the range, any alteration of the targets, or the use of anything by which the conditions of the course are altered in a sense unfavourable to the proper preparation of the soldier for war, is absolutely forbidden.

The field firing is to be carried out on ground specially chosen for the purpose, and is only to take place on the ordinary ranges when no other arrangement can be made.

The ammunition required for field firing, thirty rounds per man, is to be set apart for that purpose from the annual allowance as soon as received. Any ammunition there may be to spare after the courses of class shooting and field firing have been gone through is to be devoted to instruction shooting, to the further instruction of the bad shots, and the improvement of the best shots.

When shooting is going on, the following precautions are to be observed:—

The battalion commander is to tell off an Officer, whose special duty it will be to take charge of the ranges and to see that the prescribed precautionary measures are observed. He is to be assisted by a non-commissioned officer detailed for the purpose, and who is to have control over the arms, the ammunition, the lead recovered, the cartridge cases, &c., and to take charge of the rests, aiming apparatus, and target stores. Arms are to be inspected before leaving barracks, before shooting and after. At the end of each practice the pouches are also to be inspected. No rifle is to be left loaded when out of the man's hands. When arms are piled the breeches are to be open.

The markers when leaving the butt are to do so slowly, holding the red and white danger flag in front of them. After plugging the shot-hole they are to retire as quickly as possible, the flag-bearer last.

Signals on the bugle and drum are only permitted when movable targets are employed, and then only to serve as signals for the markers to set the targets in motion or make them visible.

Special precautions are to be taken for the safety of the markers and spectators during field firing. If no convenient positions for the markers are to be found near the targets they must be withdrawn to the men shooting. Practice is not to be carried on at more than one target on the same range.

The following *personnel* is required on the range during practice in addition to the markers. An Officer to generally superintend, a non-commissioned officer to give out the ammunition (these two are to be those specially detailed by the battalion commander previously alluded to), another to attend to the loading, whose immediate duty is to see that the men do not load till the markers have retired to their butts, and a third to write down the results in the shooting registers.

The men are to be marched to and from the ranges. Each squad, not exceeding five in number, is to be drawn up in single rank facing

the target. When the markers retire behind their butt, the man whose turn it is to fire, steps to the front and loads. It is not laid down whether he then fires or waits for the word of command.

After firing, he waits till the shot is signalled, calls out his name, and where he has struck the target, and then steps back again.

Each soldier is provided with a small book, in which the results of his shooting are entered as well as in the company register. Further, when going into the reserve, it is noted on his papers what class he belongs to, &c.

*Class Shooting.*—Officers, non-commissioned officers, and men are divided into three classes—1st, 2nd, and 3rd class. A further class is formed of those Officers and non-commissioned officers who have twice fulfilled the conditions of the 1st class. It is called the special class, and the conditions for class shooting in it are to be specially laid down by the battalion commander.

For promotion from one class to another, the necessary conditions must be fulfilled in the last five consecutive shots. Thus if a soldier fires eight shots he must obtain the necessary score in the fourth to the eighth, *i.e.*, the last five shots.

The accompanying table shows the conditions required to be fulfilled by the various classes:—

No. of practice.	Range.	Position.	Target.	Sights to be used.	Conditions to be fulfilled.
<b>THIRD CLASS.</b>					
1	100 m. (110 yds.)	Standing, with rest.	Stroke target.	Standing sight.	5 hits, of which 2 in the stroke.
2	"	" "	"	"	5 hits, of which 3 in the stroke.
3	"	" "	Infantry target.	"	5 rectangles, of which 4 looking-glasses.
4	"	Standing, without rest.	"	"	5 rectangles, of which 2 looking-glasses.
5	150 m. (165 yds.)	Standing, with rest.	"	"	5 hits, of which 4 in central third of target, 3 rectangles, 2 looking-glasses.
6	"	Standing, without rest.	"	Flap sight.	5 hits, of which 3 in central third of target, 2 rectangles, 1 looking-glass.
7	"	Kneeling.	Figure target.	"	3 hits in figure, 2 of them rectangles.
8	"	Lying down, rifle supported.	Trunk target.	Standing sight.	3 hits in figure.
9	200 m. (220 yds.)	Standing, with rest.	Infantry target.	"	5 hits, 3 in central third, 2 of which rectangles.
10	"	Standing, without rest.	"	Flap sight.	5 hits, 2 in central third, 1 of which rectangle.
11	"	Lying down, rifle unsupported.	Figure target.	"	2 figure hits in figure.
12	"	Lying down, rifle supported.	"	"	3 figure hits in figure, 2 of them rectangles.
13	400 m. (440 yds.)	Kneeling.	Section target.	450 metres.	3 hits.
14	150 m. (165 yds.)	Standing, without rest, 5 shots at word of command	Infantry target.	Flap sight.	4 "

Preparatory practice.



No. of practice.	Range.	Position.	Target.	Sights to be used.	Conditions to be fulfilled.
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## SECOND CLASS.

1	100 m. (110 yds.)	Standing, with rest.	Stroke target.	Standing sight.	5 hits, of which 3 in stroke.
2	150 m. (165 yds.)	" "	Infantry target.	"	5 hits, 4 in rectangle, of which 3 looking-glasses.
3	"	Standing, without rest.	"	Flap sight.	5 hits, 3 in rectangle, of which 1 looking-glass.
4	"	Lying down, without rest.	Trunk target.	Standing sight.	2 hits in figure.
5	"	Standing, without rest.	Infantry target in motion.	Flap sight.	5 hits, 2 in central third.
6	200 m. (220 yds.)	Standing, with rest.	Infantry target.	Standing sight.	5 hits, of which 4 in central third, 3 of them rectangles, of which 2 in looking-glass.
7	"	Lying down, without rest.	"	Flap sight.	5 hits, 3 in central third, 1 of which rectangle.
8	"	Kneeling.	Knee target.	Standing sight.	2 hits in figure.
9	250 m. (275 yds.)	Lying down, without rest.	Infantry target.	Flap sight.	5 hits, of which 2 in central third.
10	"	Lying down, with rest.	Figure target.	"	3 hits in figure.
11	500 m. (550 yds.)	Kneeling.	2 section targets together on their sides.	550 metres.	3 hits.
12	200 m. (220 yds.)	Kneeling, 5 shots at word of command.	Infantry target.	Flap sight.	4 "

Preparatory practice.

## FIRST CLASS.

1	100 m. (110 yds.)	Standing, with rest.	Stroke target.	Standing sight.	5 hits, 3 consecutively, or 4 in stroke.
2	150 m. (165 yds.)	" "	Infantry target.	"	5 hits, of which 5 in central third, 4 of them rectangles, 3 of these in looking-glass.
3	"	Standing, without rest.	"	Flap sight.	5 hits, of which 4 in central third, 3 of them rectangles, 1 in looking glass.
4	"	Lying down, with rest.	Head target.	Standing sight.	3 hits in figure.
5	"	Standing, without rest.	Figure target, in motion.	Flap sight.	2 " "
6	"	Lying down, with rest.	Disappearing breast target.	Standing sight.	2 " "
7	200 m. (220 yds.)	Lying down, without rest.	Infantry target.	Flap sight.	5 hits, of which 3 in central third, of which 2 rectangles.
8	"	Lying down, without rest.	Trunk target.	Standing sight.	3 hits in figure.
9	250 m. (275 yds.)	Kneeling.	Knee target.	"	2 " "
10	"	Lying down, without rest.	Figure target.	Flap sight.	2 " "
11	600 m. (660 yds.)	Kneeling.	2 section targets, together on their sides.	650 metres.	3 hits.
12	300 m. (330 yds.)	Kneeling, 5 shots at word of command.	Section target.	Flap sight.	4 "

Preparatory practice.

To the 3rd class belong all who have not yet gone through a course, or who have not been promoted to a higher class. Those men who fulfil the conditions of practices 5 to 12 of the 3rd class, with 70 cartridges or less, are promoted to the 2nd class. Those of the 2nd class who fulfil the conditions of practices 4 to 10, with 55 or fewer cartridges, are promoted into the 1st class. No man can be put down from a higher class to a lower one.

Those men who go through a course of instruction at the School of Musketry Instruction are at once promoted to the next highest class.

No man can be promoted more than one class in a year, so that the 1st class cannot be reached till the third year's service.

*Field firing* is divided into two parts—

1. Individual practice.
2. Squad practice.

It is to be carried out after the class shooting, which gives the necessary dexterity with the rifle, and is intended to instruct the soldier as much as possible under the conditions of war.

The *individual practice* has for its object to teach the soldier to utilise ground for cover, to rest his rifle on any support which may offer, to judge distances, and to take advantage of the time during which an object may be visible. As a rule, those under instruction will shoot one after another.

The whole of the Captains and Subalterns, non-commissioned officers, and men of all three classes take part in this portion of the course, for which ten rounds of ball cartridge are allowed per man.

*Squad practice* is intended not only to teach the men how to act together, but also to instruct and practise the Officers in fire tactics and fire discipline. The regimental or battalion commanders are recommended to take this portion of the work under their own personal guidance, and to have the various units brought up as much as possible to war strength. The practice should be based on some tactical idea, so as to fully educate Officers and men in the various incidents of a modern fire fight.

Twenty rounds of ball cartridge are allowed per man for squad practice in field firing.

It will have been noticed that nothing is laid down concerning the instruction of the men in judging distance. Captains of companies are permitted to give a special course of instruction in this portion of work to their men if they think fit,<sup>1</sup> but it is considered, as a rule, that it can be taught during the course of field firing.

*Instruction shooting* has for its object to show practically to the men what their rifles are capable of. Thus by firing against a target a number of shots from different ranges, the dispersion of the hits is shown, and comparing these with the size of a man, &c., the probability of hitting can be clearly demonstrated. Similarly by shooting at a target with the sword fixed, the effect of the latter on the accuracy of the fire is shown. Again, ten to twenty men firing at a target at different ranges with the same sight, e.g., at 640, 620, 600, 580, 560,

<sup>1</sup> "Rapport sur l'Armée Allemande." Par Baron Kaulbar. French translation, p. 122 *et seq.*

540 metres, with the sight set for 600 metres, will show what depth of ground is covered by the fire from the given distance, in this case 600 metres, and the result of not judging the range properly. If two or three different elevations of sight are employed, the increased effect thereby obtained will be clearly shown. Thus, for example, using the sights for 400 and 500 metres, it can be shown that the whole of the ground in front of the men up to 550 metres (610 yards) is swept by their fire.

By firing against a number of targets placed one behind another, the effect of the dispersion of the bullets due to differences of range may be graphically exhibited.

To increase the interest of the men in musketry instruction, every battalion receives twenty-two prizes annually; two for the non-commissioned officers of the battalion, viz., one of 9 m. (9s.) for the best shot in the special class, and one of 4.50 m. (4s. 6d.) for the best in the 1st class.

Five prizes are given for the men of each company, viz., one of 6 m. (6s.), two of 4.50 m. (4s. 6d.), and two of 1.50 m. (1s. 6d.). Of these the prize of 6 m. is given for the 1st class shots, and one of each of the other for the 2nd and 3rd class shots.

In case there are no men in one of the classes, the prizes go to the next lowest class.

The distribution of the prizes is determined by the result of the annual course. No soldier can obtain a prize who has not gone through the complete course. At the wish of the winners, the prizes of 9, 6, and 4.50 m., can be exchanged for silver medals.

In addition to the prizes, twelve badges are given to the twelve best shots of each company among the men.

In order that a comparison may be afforded to the higher authorities of the relative proficiency of the different regiments and battalions in the use of the rifle, a competition shooting (*Prüfungsschiessen*) takes place annually. It consists in the carrying out of certain exercises of a tactical character, which are set each year by the Ministry of War, and are not allowed to be made public before they are carried out. The results are tabulated and forwarded to the proper authorities.<sup>1</sup>

For the competition shooting, 3,000 rounds of ball cartridge are allowed for a battalion up to 600 strong, and 4,000 for one over that strength. In addition to this allowance, the company commanders forward annually, on the conclusion of the courses, to the battalion commander, a statement of the amount of ammunition which will be required for the next year. They also send in reports showing the number of men which have been through the course, and the number which have not, with the reasons, the number of men in each class, and names of the recipients of prizes and badges. The battalion commander combines these for his battalion and forwards them to the regiment commander, who again combines them and forwards them on to the higher authorities through the proper channel. Inter-comparison of these reports between companies, battalions, or regiments is not permitted.

<sup>1</sup> Baron Kaulbar's Report gives an example, pp. 169-70.



A very useful means of instruction in aiming is made use of in both Austria, France, and Prussia, and one which will appear novel to most of our readers, viz., the employment of the so-called *chamber rifles*.

These are rifles in every outward respect similar to those with which the men are armed, but they are of very much smaller calibre and fire a shot not much bigger than a pea. They are used, as an addition to aiming drill, to perfect the men in aiming, and possess the advantage of being safe to use in the barrack square or barrack rooms, while their use imparts a *vraisemblance* to the practice and interests the men in a degree which it would otherwise be impossible to attain. Indeed, it is found in Prussia that the men frequently have recourse to them as a source of amusement in barracks.

The Austrian chamber rifle has a calibre of  $\cdot 213$  inch, and fires a shot weighing 24.7 grains. The targets are usually placed at about 15 paces from the man, and are constructed so as to have at that distance the same effect that the real targets have at the various ranges. The French rifle has a calibre of  $\cdot 22$  inch, and fires a bullet weighing 15.4 grains. No information is given as to the Prussian chamber rifle.

Among the points most worthy of notice in the three different systems of instruction, one of the most prominent is the longitudinal division of the targets in Austria and Prussia. By this arrangement the soldier has always before him a representation of the space within which his bullet would have to hit to strike an adversary standing. It is not so much whether he hits high or low, the chief thing is to hit him somewhere, and by thus dividing the target this fact is constantly brought before and impressed on his mind.

With regard to the Prussian method of aiming, there can be no doubt of its practical utility in the field. But in target practice, as ricochets do not count towards the soldier's score, it must produce great irregularity of result. A bullet is just as likely to hit below the point aimed at as above it. If it flies low, a ricochet is the result and no score for the man, whereas, if the ball flies high, it hits the target and counts, although really there is no greater merit in the one shot than in the other. If the bottom of the target is to be aimed at, it would seem better to adopt the French system of scoring in so far as counting ricochets is concerned. The rest of this latter system, however, in which no account is taken of the position of the hit, except in the case of the annual competitions, seems a doubtful improvement on the usual manner of scoring. It is true that by means of the disc the exact position of each shot is made known to the man; but, on the other hand, this is of little avail if there be no more merit in hitting the centre than the outside of the target. Such a system must lead to carelessness and is deficient of the element of rivalry which plays so important a part in all target practice.

The Austrian and French systems of classifying the men seem to be better than the Prussian. In the two former, a man can attain to the 1st class in the first course of instruction he goes through. In Prussia, no soldier can enter the 1st class till his third year of service. The result of this is, that he has not the chance of improving himself,

whatever his natural ability for shooting may be, and, consequently, it must tend somewhat to keep down the average shooting of the army.

The absence of all systematic instruction in judging distances in the Prussian Army cannot but be regarded as a grave fault. No one denies the merit of the company chief, the company's father as he is so often called in Germany; but it would seem better not to leave so important a part of the art of shooting entirely at his mercy, to teach it or not as he thinks fit. The casual teaching which is given to the soldier during the course of field firing in estimating distances, can by no means take the place of a regular and systematic course of instruction, such as obtains in Austria or France.

That peculiarity in the manner of teaching aiming drill, by the triangle of error used in France, is doubtless of use in showing the men how easy it is not to aim properly; but it would seem probable that the time devoted to it might better be employed in exercises of a more practical character.

A great deal is thought in Germany of the instruction shooting. It is always difficult to judge of the value of any portion of a foreign system; but we fancy that most English Officers would be of the opinion that the cartridges expended on it might be more usefully employed. Men of intelligence can be taught all that it teaches equally well by means of diagrams, and it is only with such that any useful result can be expected in a branch of instruction that is of so very theoretical a character.

Too much praise cannot be bestowed on both the Austrian and Prussian methods of teaching field firing. Accuracy on the target is a very good thing, but it is of little use if the men do not shoot well in war. Both armies lay much stress on familiarizing the soldier with the incidents of the modern infantry fight; and there cannot be any doubt that the fighting value of troops is enormously increased by exercises of this nature.

The use of figure targets, moving<sup>1</sup> and disappearing targets all help to this end, quickness of aim is learnt, and the figure target must greatly help in training the soldier to fire accurately at his ordinary target in the field.

In this practical instruction, the French system is considerably behind those of the other two nations. In their annual regimental schools of instruction, however, they would appear to have a valuable means of keeping up the knowledge of the Officers and non-commissioned officers. It is on these that the direction of the fire fight now falls, and it is of the utmost importance that both should be thoroughly acquainted with all the details necessary for its proper carrying out. It has been seen how much stress is laid upon this in Germany, one of the great objects in field firing being to thoroughly instruct and keep up the knowledge of Officers and non-commissioned officers in fire discipline and fire leading (*feuer disziplin, feuer leitung*).

With regard to the employment of the rifle in the field, the Austrian regulations lay down the following rules:—

Two kinds of fire are recognized, viz., volleys and independent firing.

<sup>1</sup> These were used years ago by the late Sir G. Cathcart.

The soldier skirmishing is not to fire at an enemy, if covered up to the head over 170 yards, or if only half his body be visible beyond 250 yards. Every soldier should be able to hit an enemy standing in the open up to 170 yards, good shots will do so up to 330 yards. Isolated mounted men may be fired at up to 330 yards, if these be Officers the good shots may be permitted to shoot at them up to 500 yards.

Bodies of troops, or small columns up to the breadth of a *zug* (about 13 yards) may be fired at up to 420 yards, or 500 yards if of the depth of a company column. Larger columns may be fired at with good results by practised shots up to 750 yards.

No firing is to be permitted without orders, and is to cease immediately the command is given.

With regard to the fire of closed bodies, volleys may be fired against fully exposed bodies such as battalions, squadrons, or batteries, up to 330 yards, or against smaller objects, such as companies or *züge* up to 250 yards. If, however, the last be half hidden, then only up to 170 yards. The leaders are to be particularly careful that the volleys are fired together; for if some men are allowed to fire before or after the others, independent firing will often ensue.

Independent firing may be used at longer ranges, thus against a battalion in the open up to 500 yards, or against half-concealed companies up to 330 yards. The objection to this nature of fire is that it is difficult to put an end to, and troops get easily out of hand in using it, and to prevent this it is a common practice to define before opening fire, the number of cartridges to be employed by each man.

Concerning the use of long-range fire the following rules are given:—

The decisive stage of an infantry fight lies within a distance of 500 yards from the enemy, within which range an effective fire can be obtained. Nevertheless circumstances will often permit considerable results to be obtained up to ranges of 1,200 yards.

Fire at long range is nevertheless to be regarded as exceptional, and to be employed only against extensive objects. It is to be delivered usually in volleys, under the direct orders of the leaders of several united swarms or closed *züge*.<sup>1</sup>

It is impossible to lay down any precise rules for its application; but it is of especial worth when the enemy can be surprised by it, when he can be compelled by it to extend earlier than he would otherwise have done, or when his advance can be hindered by it. Further, it is very useful against a retreating enemy.

Care must however be taken that its use does not involve the want of ammunition at a decisive moment, and especial care must therefore be given to replacing the ammunition when it is employed.

To insure a reasonable effect for a given expenditure of cartridges it should not as a rule be undertaken with bodies of less size than a *zug*, and then only against deep columns and masses, such as company columns, closed supports, and reserves, or thick shooting lines in the open up to 1,000 yards, or against battalion or squadron columns under like conditions up to 1,200 yards. If any of these objects are

<sup>1</sup> An Austrian company is divided into 4 *züge* or sections. A swarm consists of 4 to 7 files under a non-commissioned officer. Each *zug* is led by an Officer.



partially hidden they should have a greater depth than indicated above to justify being fired at.

Batteries of artillery and large staffs may be fired upon up to 1,200 yards under any circumstances.

To save ammunition, the distance should be ascertained by means of preliminary volleys from at least a swarm (8 to 14 men), the falling of the bullets from which will enable the range to be judged.

The leader will order what sight is to be employed, and should as a rule take one rather under than over the range. If the first preliminary volley strikes short, and by the second no visible hit is made, it shows that first sight used was too short, and the second too long. One between the two should then be used. When the right range has been found the leader of the *zug* or company will order three rounds to be fired in volleys, or independently, observing the effect of the fire. If it be desirable, the firing may then be continued. When, owing to the enemy being in standing crops or high grass it would therefore be impossible to observe the points of fall of the bullets in preliminary volleys, it is permissible to employ the back sights set for two or even three different ranges. This is, however, to be very exceptional, as by so doing if the object fired at is not of great depth, a portion of the fire is necessarily thrown away.

The French regulations with regard to the employment of the rifle in the field are very general in character.

Fire is of three kinds, independent, rapid or slow, and volleys. The fire of individuals is only of value when the range is known with sufficient accuracy. By concentrating fire, on the other hand, the dangerous zone is increased by the variation in range of the different projectiles, so that it is possible, under certain circumstances, to obtain a useful effect up to the extreme limits of the sight, *i.e.*, 1,968 yards, or even to the extreme range of the rifle, about 3,800 yards.

In preparing an attack the scouts who lead the way, and who are chosen from among the best shots, commence to reply to the enemy's fire at 800 metres (875 yards). At 600 metres (656 yards) from the defender's position the scouts rejoin the shooting line, and fire is opened along the whole front.

Rapid independent firing is to be used only at close ranges, and with the back sight set for 200 metres. The men then fire as rapidly as possible.

Slow independent firing may be carried on either by the whole of a shooting line firing slowly, or by certain individual soldiers firing by command.

Volleys are particularly adapted for long-range fire, as they enable the troops to be kept better in hand.

When the men are under instruction they are to be taught the following rules for their own individual guidance.

As a rule it is not advantageous to fire at greater ranges than up to 270 yards against single or sheltered skirmishers, or beyond 440 yards, at a shooting line in the open or single horsemen. Closed supports may be fired at up to 550 or 650 yards, or reserves up to 870 yards. Larger masses of troops, or a battery of artillery, may be fired at up to 1,100 yards.

These rules are more especially applicable to the common soldiers.

Officers may, if they think fit, depart from them; but they must then indicate the object to be fired at, and the sight to be employed.

A great part of the ineffectiveness of fire in war is due to errors in judging distances. To obviate this it is proposed to furnish the Officers of the French infantry with range finders of a portable form.

Experiments have lately been conducted with numerous varieties, both optical and acoustic. The latter have been rejected as unsuited to the battle-field, and four of the optical ones submitted have been recommended for trial at the various schools of musketry. All of these gave the range of an object at 1,000 metres distance within from 35 to 38 metres, in a time varying from 2 to 2½ minutes. They are inexpensive, costing only from 8 to 40 francs, portable in form, and of solid construction, not liable to get out of order.

The Prussian drill-book lays down that it is not expedient to fire at single individuals over 275 yards, or on larger objects, such as columns or artillery, over 550 yards.

The "Musketry Instructions," however, say that if the limit of range be that at which every shot may be expected to hit, then it is not expedient to fire at over 220 yards against isolated individuals lying down or more than half under cover, or at over 275 yards at objects the breadth of a man, and of the height of one standing in the open or half under cover. Broad objects, half the height of a man, may be fired at up to 385 yards, or if the whole height of a man, up to 450 to 500 yards. If the distance be exactly known these ranges may be increased to 500 and 720 yards respectively. Beyond these limits, certainty of effect is only to be obtained by the concentrated fire of a number of rifles on the same object, and the useful percentage of hits will depend on the height, breadth, and depth of the object.

For practical purposes the Table A gives sufficient data for ascertaining the desirability or otherwise of opening fire. From this table it will be seen that up to 770 yards the company column standing suffers somewhat more than the company in line; but that from that distance up to 1,760 yards its loss is more than double. A company column lying down will suffer at all ranges twice or three times as much as a company lying down in line.

The losses of a shooting line as compared with that of a company in line will vary with its thickness as compared with that of the latter.

By the employment of two or three different heights of back sight the depth of the dangerous zone is doubled and trebled respectively. In place of there being one portion of the zone at which the bullets fall most thickly there will be two such, and consequently instead of one short central strip of greatest effect, there will be a much longer one over which the falling projectiles will be pretty equally spread.

Table B, based on a long series of experiments, carried out at the School of Musketry at Spandau, will clearly show this difference, but the averages laid down therein will only be reached when a large number of rifles are concentrated against the same object.

To get a good effect against objects distant more than 770 yards requires a large expenditure of ammunition, and if it is to be quickly attained, a proportionately large number of men must be employed.

Under certain circumstances, however, a good effect against large objects such as batteries and closed bodies of troops may be obtained up to 1,320 yards.

Three kinds of fire are recognized, viz., slow and rapid independent firing and volleys. Volleys have the advantage of keeping the men better in hand, the effect of the projectiles is more easily seen, and the sights therefore more easily regulated.

On the other hand, the men shoot better in slow independent firing; but with thick shooting lines the powder-smoke has a tendency to hang in front, and then volleys are preferable, giving time for it to clear away.

In using slow independent fire, the number of cartridges to be used, usually not more than three, should be named beforehand, so as to prevent it degenerating into an unregulated expenditure of ammunition. Pauses will by this means ensue in the fire, which will allow the smoke to clear off. With rapid independent firing the men get quickly out of hand, and from the smoke clinging to the front of the troops, it must often be unaimed. It leads also to an excessive expenditure of ammunition, and should therefore be as little used as possible.

The choice of the object aimed at will depend on tactical considerations; but frequent change of aim should be avoided, and the objects chosen should be such as afford a fair prospect of good results.

The proper elevation can be obtained from the artillery, if any be near at hand, or by preparatory volleys, or by means of a good detailed map. It is not necessary to know the exact length of the range to a yard; it is sufficient to know that it lies within a certain space, as between 500 and 600 yards or between 700 and 900 yards. Beyond 440 yards the use of one elevation of back sight only is not desirable, unless the object is motionless, its range known, and the ground on which it stands favourable to the effect of the projectiles. In all other cases, especially when the object is in motion, two different heights of back sight, differing from one another by 100 metres (110 yards) should be used. Up to 770 yards two different heights will suffice, beyond that, three will be required.

To use two different heights of sight, one should be employed by each *zug*, if three are to be employed, each rank should take one.

It is not well to employ two or three different heights of sight, unless the body of troops employing them is of at least the strength of a *zug* or company (125 to 250 men).

In determining the different heights of sight to be made use of, care must be taken that such are selected as will cover the zone to be swept with projectiles. Thus if the object lie between 600 and 800 yards from the troops, sights should be used for 650 and 750 yards, if between 700 and 1,000 yards, those for 750, 850, and 950 yards.

The great military nations of Europe, as will be seen from the foregoing pages, have lately made considerable alterations not only in their methods of musketry instruction, but also in the manner in which they propose to employ the rifle in war.

To the student of the literature which has resulted from the war of 1870-71 it may at first seem strange that this new departure, the use



of long-range fire, should originate with the nation which attributed its victories in great part to reliance on well-disciplined fire-action at close ranges; but an investigation of the evidence from which this verdict was obtained will, we think, lead our readers to admit that its recent reversal was fully justified.

The history of every action which took place during that war shows that the commencement of an infantry attack was conducted broadly as follows: the advance was first of all prepared by a concentrated fire of artillery which served in great measure to shake the hostile line. Where this could not be done, as at Spicheren, owing to want of guns and a good artillery position, or was not done, as in the case of the Guards' attack at Gravelotte, we find that either enormous loss was sustained, as in the first case, or, as in the second, the attack was brought to a standstill. When, however, it was practicable to push on, the formation most generally employed was that of company columns, the flank companies, usually in advance with one *zug* extended as skirmishers, and the other two *züge* in close order as supports, while the two centre companies, massed on the centre, followed as reserves, separating from one another as they came under the influence of the enemy's fire.

This formation, long existent as an alternative disposition of the Prussian drill-book, was only recognized as the proper one after the campaign of 1866. There had not been wanting critics who foretold before that war, that this must be the future method of attack, and Prince Frederick Charles, in his remarkable pamphlet, distinctly lays it down as being the best suited to modern requirements. The military mind, however, is no less conservative in Prussia than elsewhere, and there was a tendency throughout the whole of the Austro-Prussian War to adhere to older and more honoured forms. For instance, the Vth Corps under the well-known General von Steinmitz manœuvred throughout the campaign in half-battalion columns. Nevertheless, whatever might be the initial formation it was soon found that under fire one form only was admissible, and skirmishers, supports, and even reserves, became merged into one shooting line at open intervals. There were two reasons for this. First of all, men do not like being fired at without firing back again; do not like being killed by the enemy without a chance of killing him, which led to the supports and reserves, thrown out of their closed formations by the fire of the enemy, rushing forward to their comrades in the skirmishing line to join them in crushing him with their fire. Secondly, there was the desire to get to a range of 300 to 400 yards, from which alone the men knew they could fire with decisive effect. This course of action was greatly facilitated by the continuous fire kept up by the skirmishers, which rivetted in great measure the attention of the defenders, and thus aided the advance of the troops in rear. It must not be forgotten, however, that the Austrians were armed with a slow-firing large-bore muzzle-loading rifle, and that they proposed to overcome the superiority of fire possessed by their adversaries by the liberal use of the bayonet, thus playing into the hands of their adversaries.<sup>1</sup> They did attempt to carry out this purpose; but the attacks

<sup>1</sup> See Benedek's proclamation to his army.

were often ill-directed, carried out as a rule straight to the front, and where this was the case, or where open ground had to be crossed, they never succeeded.<sup>1</sup>

The consequence of all this was that, after the war, it was admitted that company columns covered by skirmishers was the proper attack formation, and, as we have seen, it was the one universally adopted in the Franco-German War. At the same time, it was laid down that fire could only be considered effective at close ranges, and that every effort should be made to get the troops within a proper distance before commencing the fire fight; and this form of attack was taught and practised very generally throughout the Prussian Army, as pointed out in the reply to the "Tactical Retrospect," which reply, as is well known, was inspired by von Moltke himself.

In the war against the French, however, the Prussians found an enemy armed with a weapon ten times as powerful as that which they had encountered in their last campaign, and one which was vastly superior to their own. He made extended use, too, of an entirely new feature in war, *rapid, wide-ranging infantry fire*. Not only supports, but reserves also, were struck by it, and the dissolving effect on the attacking troops was therefore much greater, and was felt much earlier in the action. No mere extension of the shooting *züge* was sufficient; it was absolutely necessary to engage a number of rifles at least equal to the number employed by the defenders. The feeble skirmishing line at first made use of could not get on without reinforcements, which were rendered doubly necessary by the heavy losses caused by the enemy's fire. And so it followed that, first of all, the supports became absorbed in the skirmishing line, and then, if the losses were severe, or if the advance were checked, the reserve, too, joined the front line, all alike eager to get near enough to the enemy to return with effect his fire, which they could not support without reply. What, therefore, had hitherto been regarded merely as a screen to cover the advance of the closed main body, became the real fighting line, made up of various companies and battalions, in some cases even of different brigades, which carried positions always in extended order, and was composed of individual groups kept together and impelled forward only by the example of their Officers and the mutual desire to act in common support against the enemy. Such a line might, and very often did, sway backwards and forwards, as it felt the pressure of the enemy's fire or was carried on by the impulse afforded to it by fresh troops sent into it from the rear; but it alone won the victory, nor is there any example of its merely preparing the way for the advance of troops in closed formations.

The descriptions of the various battles of the war, of which Woerth,

<sup>1</sup> The attack of the Archduke Joseph's brigade on the wood of Maslowed at the battle of Koniggratz was a partial success, but purchased at a heavy sacrifice. See "Campaign of 1866," translated from the Prussian official account, by Hosier and von Wright, pp. 197 and 198. On the other hand, three Austrian battalions advancing against Diletz (Battle of Gitschin, 29th June) were easily driven back by the fire of four Prussian companies. *Ibid.*, p. 136. Again at Nachod, 27th June, where 5½ battalions held at bay for three hours 21 Austrian battalions, and repulsed their repeated attacks, pp. 84—89.

Spicheren, and Vionville may be taken as good examples, given in the official account of the war compiled by the Prussian Staff, give an accurate and vivid description of this method of fighting, and may be consulted with advantage, as typifying the conduct of the attacking infantry under the influence of modern rifle fire.<sup>1</sup>

The tactical outcome of the war, then, so far as infantry was concerned, was—

1. The actual fighting must be done by troops in dispersed order, supported, if possible, by closed bodies ;

2. The decisive fire-zone extends only to 400 or 500 yards from the enemy, and every effort should be made to prevent the attacking troops opening fire till they reach this distance.<sup>2</sup>

The long-range fire made use of by the French was treated as unaimed fire, which would occasion loss to, but could never stop, a well-trained infantry.<sup>3</sup>

Now, with reference to these deductions, it must not be forgotten, that the Germans were armed with a far inferior weapon to the French, and also that the latter, although making use of long-range fire, had never trained their troops in its proper use. Therefore, it is evident that, whereas we may admit the tactical formations deduced by German experience from the late war, it by no means follows that their conclusions as to the proper use of the rifle were right, or that, because the French made use of unaimed long-range fire, it is impossible to instruct troops in the proper employment of aimed fire at ranges considerably beyond those which the successful employment of fire at short ranges by the Germans had led the latter to suppose was possible or desirable.

No one can deny the desirability of arriving at an effective range before commencing the real fire fight ; but the question arises, What is an effective range ? With the old smooth-bore, Frederick the Great loved to impress on his soldiers that they should reserve their fire till the whites of their adversaries' eyes were visible. We ourselves gained most of our Peninsular victories by the judicious use of infantry fire at effective, *then* close ranges. But events have marched since then, and with the Martini-Henry a better target can be made at 1,000 yards than could be made with Brown Bess at 100 yards ; and a review of the various wars which have taken place since the middle of the last century will prove that the tendency has always been, as firearms have improved, to increase the range at which fire may be opened. The consequence of this has been a gradual tendency to replace the tactics of shock by those of fire, and, as this involves more individual action on the part of the soldier, and has moreover the apparent, but by no means real, tendency to do away in a great measure with the authority of the Officer, there has always been the opposition cry, "Your

<sup>1</sup> For a more detailed account of what was seen and felt by a company Officer, see "The Frontal Attack of Infantry," pp. 10—13.

<sup>2</sup> Von Scherff in "The New Tactics of Infantry," written after the war, puts this distance at between 200 and 400 paces.

<sup>3</sup> See Major von Tellenbach's pamphlet, the French translation of which is entitled, "L'art d'opérer sous le feu ennemi avec le moins de pertes possible."



“troops will be a mere mob; discipline will disappear from the field, and your soldiers will no longer be kept in hand and available for the ever-varying requirements of the fight.” To which it may be replied that the problem to be solved is to see how this loosening, which cannot be avoided, may be taken advantage of and adapted to attain its true end.

It has, indeed, been a hard struggle to gain the admission that the bullet is superior to the bayonet, but it must now be finally conceded that the former, not the latter, is the true weapon of infantry, and that it is in the proper use of the rifle that superiority must henceforth be sought. It is not meant by this that the bayonet may henceforth be relegated to the same limbo with the arquebuss and pike. Far from it; occasions will still occur, as has been lately seen in the Russo-Turkish War, where a final appeal must be made to the bayonet, and if only for the sake of the moral support afforded by it to the troops, we can never expect to abolish it from the Army. What is meant is, that henceforth it is to fire, and not to the final hand-to-hand conflict, that the decision of the fight must be looked.

This being the case, we may therefore ask, Has not the day arrived when we must admit that infantry may open fire at ranges not hitherto dreamt of? The Prussian (German) answer is “yes,” and the Austrians and Russians back them in their opinion.

Let us then by reference, first of all, to actual example, and, secondly, by a consideration of the theoretical aspects of the question, see what may be expected of long-range infantry fire.

When the French entered on the campaign, they possessed, in the Chassepôt, a weapon which they knew was superior to the needle rifle, not only in accuracy and rapidity of fire, but also and more especially in range.

There was, then, a natural tendency to fire as early as possible at the enemy, and overwhelm him with a storm of bullets before he could approach to the attack, that is, at a time when, by the inferiority of his weapon, he would be unable to reply. The action at Mentana had encouraged this tendency, and, as the results of that action were well known throughout the French Army, the inclination to rely on long-range fire, which had been so successful there, was increased.

Moreover in the tactical instruction of the infantry as laid down in the “*Observations sur l’Instruction sommaire pour les Combats*,” published by the French War Office in 1867, and drawn up by Marshal Niel, great stress is laid on the value of the defensive, and on the necessity of allowing the enemy to attack in order to crush him by fire. The French nature being impulsive, and the whole tradition of the Army pointing to offence rather than defence, there would naturally be great difficulty in keeping the men in hand and restraining them from advancing. The spirit which formerly had found an outlet in the attack, and which must have a vent somehow, found it in the maintenance of an incessant fire. Deficiency in fire discipline, and the position of the troops behind cover, led to a large amount of this fire being unaimed, and the consequence was that the ground in front of

the position up to a distance of 1,200 or 1,800 paces<sup>1</sup> was more or less swept with projectiles. To such an extent was this long-range unaimed fire carried out, that in his pamphlet entitled "Mode d'Attaque de l'Infanterie Prussienne," the Duke of Wurtemberg states that the French soldiers often fired from the hip, their rifles inclined at an angle of 45°, their sole object apparently being to fire as rapidly as possible without the trouble of aiming. One result of this was that when the Germans approached the French, the latter still keeping to this method of firing, a large number of bullets would pass harmlessly away, and it was often remarked by German Officers that the nearer they approached the less did they suffer.<sup>2</sup>

Nevertheless, unaimed as it no doubt in a great measure was, this long-range infantry fire caused on many occasions severe loss to the Germans, of which perhaps the best known case is that of the Prussian Guards at St. Privat.

It will be remembered that the object of the Germans in the battle of Gravelotte was to turn the French right wing. For this purpose the Saxon Corps was sent by a long *détour* to outflank the French, while the Guard Corps had for its object a more direct attack on the enemy's extreme right. About 5 P.M., Prince Augustus of Wurtemberg, the commander of the Guard Corps, considering that the turning movement of the Saxons would soon begin to take effect, and knowing the difficulty in which the IXth Corps found itself, determined to attack the village of St. Privat. The 4th Brigade of the Guard advanced against it from St. Ail, on the south of the high road, while the 1st Brigade moved from Ste. Marie aux Chènes, on the north of the road. The brigades did not move simultaneously, as the 1st had to march from its position southwest of Ste. Marie; but it followed the 4th about twenty minutes later, commencing its advance about 5.45 P.M. Now, Ste. Marie aux Chènes is distant about 2,500 paces from St. Privat, and St. Ail is about 3,500 paces from it. Shortly after the advance commenced, that is probably the moment the battalions were seen from the French position to be advancing against it, they were met by a storm of artillery and *infantry* fire, so severe in character that none of these troops could approach nearer than about 600 to 800 paces from the village, and at 6.15 P.M. they halted, crouching on the slope or wherever a slight shelter could be found from the murderous fire of the enemy. How severe this fire was may be judged from the fact that in this advance, which did not occupy more than from a half to three-quarters of an hour, the 2nd and 4th Grenadiers and the 1st and 3rd Foot Guards (4th and 3rd Brigades) each lost one-third of their strength. The testimony of all concerned, points to this loss being chiefly caused by rifle fire<sup>3</sup> delivered at ranges varying from 800 to 2,000 paces.

<sup>1</sup> See "Studies in the New Tactics of Infantry," by von Scherff; and also von Schell's latest work, "Studie über die Taktik der Feldartillerie."

<sup>2</sup> "Frontal Attack of Infantry," p. 31, and "Mode d'Attaque de l'Infanterie Prussienne," p. 10.

<sup>3</sup> See the "Official Account of the War," vol. ii, p. 128 *et seq.*; Hoffbauer's "German Artillery," p. 264 *et seq.*; "Mode d'Attaque de l'Infanterie Prussienne," p. 15. The percentage of the German losses due to infantry fire was 94 per cent., the artillery only causing 5 per cent., and Hoffbauer says, moreover, that the French

It is true that the formation used by the Guards was a very deep one at first setting out, but the fire of the enemy soon dissolved it into a deep skirmishing line, in which form a large proportion at least of the loss must have been sustained.

Here, then, we have an actual example which proves beyond doubt that long-range fire is capable of inflicting great loss, and the result of this portion of the battle of Gravelotte may be fairly used as a powerful argument in its favour. If it be objected that this fire was unaimed, it may then be replied that from aimed fire greater results may be hoped. But if, on the other hand, we assume that it was to a certain extent aimed, then also may we expect that when an infantry has been trained in its execution, which the French certainly were not, an increase in effect will be the consequence.

The value of long-range infantry fire has received a further proof in the war between the Russians and the Turks. Here, as in the Franco-German War, the one side was much better armed than the other. For the Martini-Peabody rifle and the Krupp breech-loading gun were as superior to the Krinka rifle and the bronze muzzle-loader, as the two latter were to the arms of the past half century.

The Russian military review, "*Woyainie Sbornik*," in its number for May,<sup>1</sup> has published the views of General Seddeler on this subject. This Officer, who commanded the 1st Brigade of the 2nd Guard Infantry Division through the war up to the action of Gorny Dubniak, 24th October, 1877, when he was wounded and compelled to leave the Army, says (and in this all eye-witnesses of the war concur) that the fire tactics of the Turks consisted simply in firing at all distances up to the extreme range of their rifles as quickly as was possible. The consequence of this was, that at even 2,500 yards the effect of the infantry fire began to be felt.<sup>2</sup> At 1,700 yards the losses therefrom became considerable, and from that distance onwards the fire grew hotter and hotter, till at last it became a perfect rain of lead, such as none but those who have gone through can possibly picture to themselves. Contrary to what had been often experienced during the Franco-German War, the fire was not much less deadly at the nearer ranges than it had been some distance further off, and the actual attack was only carried out with frightful loss.

Now the Turkish infantry is essentially an uninstructed one. A large proportion were perfectly ignorant of the proper use of sights, and if, as there can be no doubt, their fire, in great part unaimed, in the true sense of the term, could yet produce such fearful losses, it stands to reason, that had the Russians been opposed by a better trained soldiery, their losses would have been far greater.

So far the value of rapid long-range infantry fire as shown by example. Let us now investigate the question theoretically, and see to what extent the proposed change is justified.

artillery had been obliged to withdraw to the rear (p. 236), its fire could not therefore have been very formidable.

<sup>1</sup> A translation of these into German has appeared in Nos. 64, 65, 70, 72, 73, and 74 of the "*Militair-Wochenblatt*" of this year.

<sup>2</sup> General Todleben, in a letter to General Brialmont, dated 18th January, 1878, says:—"The infantry fire fell like a rain of bullets up to more than two kilometres (2,200 yards) distance."



As long as infantry were armed with a muzzle-loading rifle, there was good reason to place chief reliance on the effect of close-range fire. The weapon did not permit rapidity, and was inaccurate at ranges beyond those at which the object aimed at was clearly visible, say 400 to 500 yards. The assailant, moreover, made use of closed formations, chiefly columns, which advanced without firing, or which, at the best, could give but a very feeble fire. If, then, the fire was reserved till these neared the defendants, the effect would be so very great as in most cases to be decisive. Now, however, the attack takes place exclusively in open order and a powerful fire is brought to bear on the defenders. No closed bodies of troops are offered as targets to the rifles of their adversaries within anything like what may be called close range, and by far the best objects to fire at, both for moral and physical reasons, are formed now-a-days by the front shooting line of the enemy and its supports. To reserve all fire against these until they reach ranges at which it would have been possible to effectually crush them with the old rifles, would be wilfully to throw away the advantage of the new ones, viz., rapidity and accuracy at long range. The experience of two campaigns has shown, that with modern weapons, even unaimed, undisciplined fire is capable of giving great results at long ranges, and if, therefore, we can employ well aimed fire, it follows we shall obtain greater results.

Several objections have been made to this deduction.

1. Long-range fire is not so effective as supposed, the proportion of hits to misses being very great, and it follows, therefore, that it is better to reserve fire for ranges where the proportion is more favourable.

2. It would be impossible to keep up the necessary supply of ammunition, and, consequently, there would very likely be a dearth of cartridges at the decisive moment of the struggle.

3. The employment of long-range fire would be the death of the spirit of the offensive.

4. The large columns and other widely spread-out objects, against which this species of fire is thought to be so very effective, are less and less seen on the field of battle.

5. Firing at the same object with the sights set for different ranges, as proposed in Germany, is the negation of accuracy of fire.

With regard to the first objection, it must at once be admitted, that we have no statistics based on experience in actual war, as to the "useful effect" obtained by troops who have employed long-range fire in the field.<sup>1</sup> But we have a large mass of information derived from peace experiments, and although they will not, of course, represent what may be expected in war, still, whether experiments are carried on at short or long ranges, it cannot be admitted that the proportion between war and peace results should be greater in the one than in the other case.

Trials made in France and in Austria would seem to show that an

<sup>1</sup> It is improbable, however, that the French 6th Corps at Gravelotte expended more than about 60 rounds per man; at any rate, recent evidence shows that the want of ammunition could not have been so great as was at one time supposed. See "*Methodes de Guerres Actuelles, &c.*," vol. i, p. 674.

average shot would hit a man once in three times at about 600 yards. On the other hand, it is said that the useful percentage of shots fired in actual war varies from 7 to 12 per cent.<sup>1</sup> Be this as it may, the percentage would be the same for all ranges, and will not, therefore, affect the question.

Since 1872, a number of experiments has been carried on in Prussia, at Spandau, and in Bavaria, at Munich, with a view to ascertaining the actual value, under conditions resembling as much as possible those of war, of long-range fire. The questions which were put for solution were:—

1. Has rapid long-range infantry fire directed against a visible or invisible enemy any value in war?

2. If so, how should it be applied, by volleys or by independent firing?

3. What regulations are necessary to maintain fire discipline if it be introduced?

The replies to the first of these questions being favourable, resulted in the new rules for the use of the rifle in war, embodied in the newly published "Musketry Instructions," which also deal with the third query. With regard to the second, it was found that although rather better results were obtained from independent than from volley firing, still the latter is so much more favourable to leadership and keeping the men in hand, that it should, as a rule, be employed for this kind of fire.

So far as the actual effect is concerned, the outcome of the experiments is shown in tables A and B at the end of this paper, which certainly show a sufficiently useful percentage to justify the use of long-range fire. Since then, the new musketry manual has been introduced, and the exercises therein laid down have been carried out in various regiments.

In the *Allgemeine Militär Zeitung*, of the 8th of April of this year, a German Officer gives the following account of what he saw at a field firing practice at which he was present.

"A thick shooting line was represented by 240 head targets placed chequerwise. To these 120 skirmishers were opposed, who first of all ascertained the range by preparatory volleys, and then fired with two different elevations 1,800 shots. The number of hits was 69, or nearly 4 per cent., the number rendered *hors de combat* being 61 men, some of the figures receiving more than one shot.

"On the same occasion, 90 breast targets were placed at distances apart equal to their breadth, and 600 shots were fired at them from a distance of 600 metres, with two heights of sight. The number of hits was 38,  $6\frac{1}{2}$  per cent., putting 26 men out of action.

"Lastly, at a range of 700 metres, 100 whole figures were arranged as in the second case. With two different elevations 300 shots were fired at them. The number of hits was 27, *i.e.*, 9 per cent., which put 22 men out of action."

Now these experiments were conducted under conditions representing, as far as possible, the conditions of actual war. It is not too much to say, that the results are much more favourable than we have hitherto been led to suppose could possibly be the case.

<sup>1</sup> See "Instructions Pratique de la Compagnie d'Infanterie, &c.," p. 154 *et seq.*

In Austria also, where long-range infantry fire has for some time past been growing in favour, numerous experiments have been made, and among the troops themselves two courses have been carried out, one in the winter of 1876, and one in that of 1877. The average percentage of hits obtained in 1877, during the course of field firing, at ranges varying between about 670 yards and 1,140 yards, and 1,140 yards and 670 yards, the men advancing and retiring, was 31·2. The object aimed at, representing a double column of company columns on the centre, was formed by three targets placed one behind the other, with intervals of 24 paces, each target being 6 feet high and 120 feet long. It is true that such objects as columns measuring 40 yards each way will seldom be met with on the battle-field; but if a like percentage be maintained, a company column would have been struck 7 times out of every 100 shots fired in volleys by the attacking troops while advancing and retiring over ground between ranges of nearly 700 and 1,200 yards. It must, moreover, be remembered, that the weather was extremely unfavourable, even for winter, when the shooting took place.

On 26th February of this year, some experiments were conducted at Vienna against artillery. A company of infantry fired at 1,400 metres (1,532 yards), against targets representing 3 guns in action, with their detachments. Ten cartridges were fired by each of the 211 men in the ranks of the company. Nearly 10 per cent., or 189 balls, struck the targets, in other words, the guns were silenced in about  $3\frac{1}{2}$  minutes, the whole of the 108 men forming the *personnel* being hit within that time.

As was remarked in a recent lecture given by Lieutenant-Colonel Grossmann of the Artillery, at Vienna, such experiments tend to show that the artillery will be called on to suffer very sensible losses at 1,600 paces instead of 800 paces, which has hitherto been considered the limit of the effect range of infantry fire.

In August last a very excellent example of how field firing should be conducted was given by the 3rd and 26th battalions of riflemen stationed in Upper Austria.

On the 19th August these two battalions started from the respective garrisons at 2 P.M. in full marching order with two days' rations of biscuit. The day was very hot, the thermometer marking 104° Fahrenheit. They reached their bivouac at 9 P.M., after a march of about fourteen miles, placed their outposts, lighted their camp fires and bivouacked on the bare ground. The next morning they stood to arms at 7.30 A.M., and the two battalions, which were on peace strength, were united so as to form one on war strength. The total number of men in the ranks was 743, of whom 84 were 1st class, 328 2nd class, and 331 3rd class shots.

The ground over which the manœuvre took place consisted of a valley between two far-projecting spurs. The enemy occupied the upper end of the valley, the lower end of which was closed by the village of Edtsdorf. From the village to the position occupied by the defenders was a distance of about 2,500 yards. For the first thousand yards the slope was gentle and regular; but thence it became much more undulating and afforded good cover in places to the attacking troops. On the other hand these



undulations often hid the enemy from view, especially from that portion of the ground comprised between 670 and 840 yards from his position. The right flank and centre of the defenders' shooting line was also partially hidden by a row of trees in front of it. The northern spur was clothed on its northern side with a wood which was of considerable tactical value in turning the defenders' flank.

It will thus be seen that the position was one of an average character such as might frequently be met with any day in war. The enemy which occupied it was supposed to be three companies strong. The shooting line was about 200 paces long, divided into five sections. It was formed by targets 1 foot high and of the requisite length. There were three supports represented by targets 61 feet 7 inches long and 37 inches high. The reserves were represented by disappearing targets 54 feet long, the full height of a man, viz., 5 feet 6 inches. These were made visible for 5 to 10 seconds at intervals of 3 to 5 minutes.

The line occupied was fairly straight except that the left flank was thrown forward, forming an offensive crotchet.

The proceedings were conducted in strict accordance with a tactical idea laid down beforehand. At 8 o'clock the battalion commenced its advance towards the ground where the firing was to take place. At 10.10 A.M. the advanced guard made out the position of the enemy. At 10.20 A.M. the fight commenced by the advanced guard, one quarter of the 4th company, firing volleys on the enemy, at about 1,200 to 1,500 paces (1,000 to 1,250 yards). When at about 900 yards from the defenders the shooting line was formed by the whole of the 4th company, the 3rd acting as its support at 1,150 yards, the 1st and 2nd companies being in reserve. One section of the 3rd company and one of the 1st fired volleys over the head of the skirmishers, which the nature of the ground permitted to be done, the range being about 1,150 yards. At about 750 yards the shooting line was formed by the 3rd and 4th companies with one section of the 1st, the remainder of the battalion being in reserve.

At 400 yards the 1st, 3rd, and 4th companies formed the front line, the 2nd being in support. At 170 to 200 yards, the 2nd company joined the right flank of the chain in closed order. The intention being to turn the enemy's left flank, the right prepared to advance covered by the rapid fire of the left; but at this moment the action was stopped, the commandant of the battalion thinking the object of the exercise was gained. In a shooting line extending over 300 paces reinforced by the supports in closed ranks, the fire had twice been stopped, the greatest difficulty was conquered, to continue the fire would only be to riddle the targets.

It may be fairly said that here we have practical experiment bearing all the impress of war.

Up to a distance of 400 yards from the defenders, shooting line and supports alike fired volleys, the former by swarms. From that point independent firing was used, the number of cartridges being always fixed beforehand. Rapid independent firing was employed only for a short time at the last moment.

The number of cartridges fired was 21,193, of which 2,292, 11 per

cent. nearly, struck the targets, 1,686 of them within the figure spaces marked out by a black outline. The supports suffered most, 77½ per cent. striking them; 12½ per cent. struck the shooting line and 10 per cent. the reserves.

These results are not so good as have been obtained on other occasions, but are especially valuable from their practical character, representing more nearly what may be expected in war.

Recent experiments in Russia have shown that, at even at 3,000 yards, 8 per cent. of the bullets from a Berdan rifle falls within a space of 30 paces by 30 paces. The correspondent of the *Standard*, in the issue of the 16th September, states that the Officers who had been ordered to the camp at Chalons, to see some experiments conducted with long-range infantry fire, were much struck with the effects obtained, and that "it has been satisfactorily proved that, if a company "of infantry succeed in creeping up to within 1,200 or to 1,500 yards "of a battery of artillery, horses and men would all be disposed of in "a very few minutes."

The question has also been worked at in the British Army and experiments on the subject have been made at different stations. *The Times* of the 23rd and 25th October gives the following accounts of some that were recently carried out at Dumdum and Meerut.

At Dumdum a half-battery in action was represented by logs of wood on trestles placed at proper intervals, the gunners being represented by targets painted black, 4 feet high by 20 inches broad at the bottom, but narrow at the top to represent a man's head, which was painted white. The limbers and teams were represented by targets, 8 feet square, painted a neutral tint. Twenty men fired 200 rounds at 1,500 yards independently, hitting the gunners eight times, the limbers and teams three times. They then fired volleys by alternate sections of ten, firing altogether 200 rounds with the following result, viz.:—hits on gunners, 28; hits on limbers and teams, 16; total, 44.

At Meerut, 56 men fired 948 rounds in 2 minutes 57 seconds, at a target 18 feet long and 6 feet high, at a range of 1,200 yards, making 153 hits, or 16·35 per cent.

Now, we have seen what has been accomplished in actual war by long-range fire, and we have also seen what has been the result of peace experiments. The two nations—Germany and Russia—who have suffered more from its employment are now its warmest advocates. Austria and France follow suit, and in the face of such a consensus of opinion, backed by actual experience and supported by a long course of experiments, it is not too much to say that the first of the objections to its use, viz., that the result is not worth the expenditure of ammunition, is fully refuted.

Long-range firing must be under the immediate supervision of the leaders, the men can never be allowed to open fire when they like, and to fire as many cartridges as they like. But if an Officer sees that an opportunity offers of employing long-range fire with success, it would surely be wrong to say under no circumstances is it to be permitted.

The question is, what is waste of ammunition? Is every bullet that does not hit a man wasted? If so, the vast proportion fired even at short ranges is thrown away. In reality the employment of ammunition only ceases to be judicious when the number of hits does not bear a proper relation to the number of cartridges expended, *i.e.*, with the results which ought to be obtained, taking into consideration the known ballistic capabilities of the weapon. Admitting this, the foregoing pages show plainly that long-range firing is admissible.

With regard to the second objection, *viz.*, the vast expenditure of ammunition and the consequent difficulty of supply, it may be remarked that precisely the same objection was urged on the introduction of breech-loaders. Nevertheless, three wars have been fought with breech-loading rifles, and where a proper discipline obtained, no difficulty in the supply of ammunition was felt.

If, as is doubtless the case, a somewhat larger supply of ammunition will be required—General Seddeler says each man should have 105 rounds with him—this is a question of administrative detail, one which the Turks successfully solved both on the offensive and defensive, and it is surely not therefore beyond the capability of civilized nations.<sup>1</sup> In England the adoption of the Oliver equipment would entirely settle the question.

It is further urged that the introduction of long-range fire would be the death of the offensive spirit, the true secret of success in war.

This objection is one which, being based chiefly on moral grounds, is very difficult to prove or disprove.

"If," say the opponents of distant fire, "you allow men to open fire from a distance, you won't get them to advance. They'll prefer to lie quietly where they are and fire away at what they think a safe distance from the enemy."

But, on the other hand, it may be replied that this would only be possible with undisciplined troops, not in hand as they should be. Moreover, if the men find their fire is taking effect, there will be very little difficulty in urging them on to complete the defeat of the enemy. As a practical fact, too, it may be added that in all wars it is found that when men advancing begin to feel the fire of the enemy it is impossible to restrain them from replying to it.<sup>2</sup>

Another point, which is made a great deal of, is that the advocates of long-range fire base much of their argument on the loss which will accrue to large columns, such as a battalion column, whereas such formations will no more be found on the battle-field.

This objection may to a certain point be admitted, but practical experience and experiment alike go to show that smaller objects, such as company columns and thick shooting lines, would suffer considerably from fire at ranges hitherto thought beyond danger.

At any rate, it must be admitted that the new fire will affect consi-

<sup>1</sup> See Colonel Clive's lecture, vol. xxi, p. 831 *et seq.*, of the Journal of this Institution.

<sup>2</sup> A good example of this is given at page 10 of the "Frontal Attack of Infantry," and it is well known how impossible Frederick the Great found it to get his troops to advance without firing. Marshal Bugeaud says the same of the French columns attacking the English in the Peninsula.



derably the rôle of artillery and cavalry. Neither of these arms can avoid offering a large target to the enemy. Cavalry can do nothing till it closes with its enemy, and it will now suffer from rifle fire from 1,500 yards to the muzzle. At 1,500 yards fifty men in dispersed order would afford but a poor target to a battery; nevertheless, concentrating their fire on gun after gun, they would, as we have already seen, very quickly reduce it to silence.

With regard to the last objection, which, however, is one chiefly affecting the German mode of employing long-range infantry fire, it is impossible, in the present state of the question, to say definitely whether it is, or is not, expedient to fire at the same object with two different heights of sight. The bullet-rain is thereby spread more evenly over a given surface and the zone of greatest effect is considerably deepened. But, on the other hand, within each half of that zone only half the number of bullets fall that would take effect were only one sight employed. Consequently it would seem that, unless the object fired at were moving, or the range were unascertainable with anything like accuracy, or the object itself were very deep, it would not be judicious to employ it.

There is no doubt that the general question under consideration is bound up to a very great extent with that of judging distance; for at long ranges the depth of the dangerous zone becomes very small, and if a proper effect is to be produced, the range must be accurately ascertained. The French, as has been before mentioned, are making experiments with infantry range-finders. We too in England have been doing the same. In the meantime recourse must be had to preliminary volleys, estimation by the eye, or to detailed maps. None of these, of course, are so accurate as a telemeter; but imperfect as they are, they have given results, as in the case of the Austrian experiments, which are by no means to be despised.

What, then, will be the effect of the general introduction of long-range infantry fire? It will be necessary to take up the formation for combat considerably further off, and thus if faults are made in the original dispositions, they will be harder to repair.

The employment of reserves will be more difficult. If they are to be preserved intact, they must be kept well in rear, and as a consequence it will not always be possible to ensure their opportune arrival. The artillery will be forced further back, or will be obliged to resort to some such expedient as bullet-proof shields.<sup>1</sup>

For the temporizing fight,<sup>2</sup> as in front or rear-guard actions, or for points where it is only intended to demonstrate, this nature of fire will be particularly suited. Again, it will often be possible by fire from long ranges to deceive the defender as to the real point of attack, and it will be of peculiar value in a pursuit.

On the defensive it will often obviate the necessity of occupying points which can now be covered from the main line.

<sup>1</sup> First used by Colonel C. Gordon, R.E., in China, and now proposed for introduction in the Artillery by Colonel C. B. Brackenbury, R.A.

<sup>2</sup> e.g., Prussian attack on French left at Gravelotte, as it should have been conducted.

It will be of great advantage in turning movements, since it will be possible to pour in a powerful enfilade fire suddenly from a much longer range than has hitherto been the case.

One of its most important qualities is the power of using it over the heads of men in front, thus often enabling two or more stages of fire to be used. What the effect of this is has lately been seen round Plevna, where the Turks often had two lines of infantry, one above the other, causing thereby enormous losses to the Russians.

It will enable a much more powerful fire to be concentrated by the attacking force on any point of the defenders' line, since troops from more distant parts of the field can take part in it.

Lastly, in the case of troops attacking a position on the crest of a dominating plateau, they will be able to sweep its surface for such a distance to the rear as will render it much more difficult for the defenders to bring up supports and reserves to the threatened point.

Such are the arguments against and in favour of the employment of long-range infantry fire now in use on the Continent. It is for our readers to settle which side has got the better of the controversy.

Before concluding, however, we would say one word on the question of the rifle.

At present every nation of Europe is armed with weapons which are specially designed for effect at long range. It would seem more logical, therefore, either to make use of this property, or else to change the armament; for if short ranges only, up to about 500 or 600 yards, are to be employed, then a rifle constructed more on the principle of the sporting express could be made which would be far more effective.

But it is scarcely possible that this view should obtain many supporters. The history of the rifle shows a continuous progress in its accuracy at long ranges, it is probable that this progress will go on and that we may look in the future to as great an increase of power over the present weapons, as was obtained twenty years ago by Mr. Whitworth, when he brought out his rifle, the antetype of all modern infantry firearms.

The right path to pursue then is, first of all, to train the soldier thoroughly in the use of his rifle, not merely to make him a good target shot, but to teach him how to employ it as he must in war. Secondly, every effort should be made to improve his weapon. As it stands, the Martini-Henry is the best rifle in Europe; but there is no reason why it should not be improved. There is no finality in firearms any more than in tactics, and if the Napoleonic maxim be true, that to maintain pre-eminence it is necessary to change our tactical system every ten years, it is no less necessary to see that in the purely mechanical question of the rifle, we do not merely keep up with, or content ourselves with not falling behind other nations, but seek rather to go far beyond them.

TABLE A.

Back sight set for	Depth of dangerous zone covered by the projectiles.	Percentage of hits on targets representing				Using the under given number of cartridges per sight.	Number of targets struck out of fifty representing men standing placed at equal intervals over a breadth of 110 yards.
		Men erect 6 feet high		Men lying down $\frac{1}{2}$ height of men standing			
		In line.	In company column.	In line.	In company column.		
450 yards, . . . .	From the muzzle up to 500 yards.	50 to 70 p.c.	60 to 80 p.c.	15 to 20 p.c.	25 to 30 p.c.	200	35 to 41
550 " . . . . .	110 yards . . . . .	30 to 60 "	40 to 65 "	6 to 18 "	15 to 30 "	200	25 to 38
660 " . . . . .	" . . . . .	25 to 50 "	35 to 60 "	5 to 15 "	15 to 30 "	200	25 to 38
770 " . . . . .	" . . . . .	18 to 35 "	30 to 45 "	4 to 10 "	12 to 25 "	200	20 to 35
880 " . . . . .	" . . . . .	15 to 30 "	20 to 40 "	3 to 9 "	6 to 19 "	200	12 to 33
990 " . . . . .	" . . . . .	10 to 25 "	15 to 40 "	2 to 8 "	6 to 18 "	300	20 to 35
1,100 " . . . . .	" . . . . .	7 to 20 "	15 to 35 "	1 to 6 "	6 to 15 "	300	15 to 35
1,210 " . . . . .	" . . . . .	6 to 17 "	15 to 30 "	1 to 6 "	6 to 15 "	300	15 to 28
1,320 " . . . . .	" . . . . .	5 to 15 "	10 to 27 "	1 to 4 "	5 to 14 "	300	12 to 25
1,430 " . . . . .	" . . . . .	4 to 12 "	10 to 22 "	1 to 3 "	4 to 8 "		
1,540 " . . . . .	" . . . . .	4 to 10 "	10 to 14 "	1 to 3 "	4 to 8 "		



# HEIGHT OF SIGHT.

6 feet long, 6 feet high to represent men standing

Back sig adjusted			Mean centre of impact.										
	20	10		10	20	30	40	160	170	180	190	200	210
Number of hits excluding ricochets.													
400 m	70	68	71	61	61	57	36	4	3	3	2	2	1
	79	77	77	68	66	57	37	4	3	4	2	2	1
500 m	51	56	64	58	50	44	37	3					
	69	71	68	59	52	47	39	3					
600 m	48	49	52	51	47	34	31	1					
	62	56	62	64	52	42	37	1					
700 m	26	29	35	28	33	32	26	2					
	39	42	45	40	39	41	32	2					
800 m	24	24	31	27	29	23	19						
	37	40	42	41	39	30	21						
900 m	14	24	31	23	23	22	19						
	38	42	42	38	29	25	23						
1000 m	9	15	27	26	13	5	7						
	27	38	42	31	17	11	18						
1100 m	7	17	18	17	14	12	15						
	19	24	29	29	23	25	20						
1200 m	13	15	22	14	10	6	7						
	31	34	35	22	15	12	9						
1300 m	8	8	14	7	10	8	6						
	32	19	22	17	19	12	11						
1400 m	8	10	11	10	9	17	9						
	21	26	22	24	25	25	13						

## AGAINST MEN LYING DOWN.

400 m	15	30	47	42	31	14	13					1	
	55	61	74	56	44	27	23						
500 m	22	40	41	32	28	20	26	1	3		1	2	1
	51	63	63	52	53	45	39	4	4	3	4	3	1
600 m	22	20	29	23	17	10	7						
	49	52	57	43	29	18	13						
700 m	13	13	27	22	12	7	13						
	32	49	54	40	29	29	22						
800 m	16	16	19	7	10	10	4	.	.	1	.	.	2
	36	38	34	28	25	16	9	.	.	3	1	2	4
900 m	8	9	14	13	10	14	4						
	37	33	35	37	30	27	12						
1000 m	11	8	8	4	9	7	8						
	33	26	23	23	19	22	24						
1000 and 900 m	6	13	13	6	5	8	8						
								2	1	1	5	5	5
								5	5	4	5	5	8
								31	45	23	24	21	8
								4			4		4

the men firing in metres.

10	1190	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	13	1470	1480	1490	1500	1510	1520	1530	1540	1550
----	------	------	------	------	------	------	------	------	------	------	------	----	------	------	------	------	------	------	------	------	------

ding ricochets.

100 and 1000																					
100 and 1100	4	3	3																		
100 and 1200	34	36	30	32	16	16	10	4	1	.	1	1									
100 and 1300	37	46	39	36	30	30	31	24	13	11	22	27									
100 and 1400	14	18	13	15	18	23	27	37	33	32	36	46	6	5	2	1	2	.	2	.	1
													13	12	12	9	4	1	3	3	4

100 m. = 110 yds. roughly.

TABLE A.

Back sight set for	Depth of dangerous zone covered by the projectiles.	Percentage of hits on targets representing				Using the under-given number of cartridges per sight.	Number of targets struck out of fifty representing men standing placed at equal intervals over a breadth of 110 yards.
		Men erect 6 feet high		Men lying down $\frac{1}{4}$ height of men standing			
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880 " .....	" .....	15 to 30 "	20 to 40 "	3 to 9 "	6 to 19 "	200	12 to 33
990 " .....	" .....	10 to 25 "	15 to 40 "	2 to 8 "	6 to 18 "	300	20 to 35
1,100 " .....	" .....	7 to 20 "	15 to 35 "	1 to 6 "	6 to 15 "	300	15 to 35
1,210 " .....	" .....	6 to 17 "	15 to 30 "	1 to 6 "	6 to 15 "	300	15 to 28
1,320 " .....	" .....	5 to 15 "	10 to 27 "	1 to 4 "	5 to 14 "	300	12 to 25
1,430 " .....	" .....	4 to 12 "	10 to 22 "	1 to 3 "	4 to 8 "		
1,540 " .....	" .....	4 to 10 "	10 to 14 "	1 to 3 "	4 to 8 "		



The men fired lying down with their rifles supported on any available object. The targets were 65 feet 7 inches long, 6 feet high to represent men standing, 1 foot 6 inches for kneeling men.

RESULTS OBTAINED WITH ONE HEIGHT OF SIGHT AGAINST MEN LYING DOWN.

### RESULTS OBTAINED WITH TWO HEIGHTS OF SIGHT' AGAINST A COMPANY IN LINE STANDING.

N.B.—To turn metres into yards add one-tenth, *e.g.*, 100 m. = 110 yds. roughly.



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### LECTURE.

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Friday, June 28th, 1878.

LIEUTENANT-GENERAL SIR ARNOLD KEMBALL, K.C.B., K.C.S.I.,  
in the Chair.

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#### LESSONS FROM THE LATE WAR.

By Captain JOHN L. NEEDHAM, R.M.A., Professor of Fortification,  
Royal Naval College, Greenwich.

SIR ARNOLD KEMBALL, Ladies, and Gentlemen: Since, in compliance with a wish expressed by the Council of this Institution, I undertook to prepare a lecture on "Lessons from the late War," it has been remarked to me by more than one Officer whose reputation as military writers and critics gives weight to any opinion expressed by them, that the time has not yet come for drawing deductions from the war of 1877; that we have not as yet sufficiently detailed and authentic information to enable us to draw conclusions from the events of the campaign just concluded. Now, Sir, it is true that no such complete and impartial narrative of the late operations in the East has as yet been published as is contained, for instance, in the German Official Histories of the Campaigns of 1866 and 1870-71 of the events recorded in those works; but, nevertheless, an immense mass of literature has already appeared, in which many of the operations of the late war are described with more or less minuteness, and discussed with more or less impartiality. In the first place we have the graphic and picturesque, and comparing them with later accounts, I should say remarkably accurate descriptions of many of the chief events in the war telegraphed home, while the scenes they described were still fresh in their memory, by the Special Correspondents of the press; by correspondents not only of English, but also of Continental papers; by correspondents, many of whom were Officers of known and proved ability, conversant with the theoretical as well as the practical branches of their profession. We have official reports of many of the principal episodes of the campaign:—such as those written by the Grand Duke Nicholas, by General Gourkho, by General Skobelev, General Krudener, and other Officers holding high commands. We have the fragmentary but shrewd notes jotted down from time to time

by that keen observer and unsparing critic, Captain Kouropatkine of the Russian General Staff. We have the plain unvarnished narratives of non-commissioned officers and men of the Russian Army. We have the more carefully written histories of the campaign published by Mr. Norman and Mr. Williams; while other accounts have appeared lately in the pages of the Austrian *Organ der Militär-Wissenschaftlichen Vereine*, and of the Prussian *Militär-Wochenblatt*; and, finally, we have the very admirable account of the struggle round Plevna, recently published by the well-known German military writer, Captain Thilo von Trotha. Well, Sir, there is, I would submit, much to be learnt from all these accounts taken and compared together; and since I have been obliged, from various causes, to devote much time to the study of them, I propose this afternoon to lay before you a short summary of some of what seem to me to be the principal deductions derivable from the accounts I have alluded to; trusting that in the discussion which I hope may follow, remarks may be made and opinions elicited which will prevent this afternoon being recorded as altogether a blank day in the journals of this Institution.

The most convenient way of dealing with the subject before us will be, I think, in the first place, to enumerate the deductions derivable from the late war; and then, taking them in succession, indicate the particular episodes or events of the campaign upon which they are based, or which would seem to confirm the truth of them; and here I may remark that since it would obviously be simply impossible to touch upon all the points of so wide a subject in the time to which the Council of this Institution very wisely limits lectures delivered here, I shall confine myself exclusively to the tactical lessons of the campaign; leaving the broader questions of strategy, and of the administration, organization, and mobilization of armies, to be dealt with by some more competent person; and I may add, that one or two of the points to which I shall refer have already been alluded to in a lecture recently delivered in this theatre, and in the discussion which followed; but since on that occasion much more attention was given to another question raised in the same paper, it will, I think, be allowable to refer to them briefly again.

From the experiences of the late war may be adduced, I venture to submit:—

in the first place, the imperative necessity, under contemporary conditions of warfare, of utilising the power of firing at long range conferred upon infantry by modern improvements in the weapon they carry;

in the second place, the necessity for improving and perfecting arrangements both for insuring that there shall always be a sufficient supply of ammunition at hand, and also for issuing and distributing cartridges to men actually engaged; and, also, the advisability of lightening the equipment of the soldier—of decreasing, as far as possible, the weight of his kit—both in order that he may be able to move more rapidly and with less fatigue, and also that he may be able to carry about his person a greater number of cartridges than he can at present;



in the third place, the necessity of providing that there shall always be a sufficient supply of intrenching tools forthcoming and available, not only before and after an action, but also at any moment when they may be wanted during the course of a battle; and, also, the necessity for exercising men to a greater extent than is done at present in digging; of practising Officers in designing and tracing, and men in actually constructing such hasty intrenchments and field fortifications as may be employed with advantage on a field of battle, or for the defence of a position;

in the fourth place, the necessity for adding to the artillery of an army a proportion of guns of larger calibre and greater power than any now employed; and, also, of rendering the light guns of an army as mobile as possible, so that they may be able to accompany an attack as it progresses.

Such then I venture to submit are some of the most important tactical lessons to be derived from the late war. In enumerating them I have given the precedence to the subject of long-range fire, because it seems to me that the constant use of this fire by the Turks is the most striking feature in the tactics of the late war. It has been remarked that every campaign which has been fought during the last quarter of a century has been characterised either by the introduction of some new or greatly improved weapon, or by the adoption of some new tactical procedure. The Crimean War, for instance, will be remembered in history as the first campaign in which rifled muskets were used. The Italian War of 1859 as the first occasion on which rifled field-pieces were employed. The American War of Secession from the introduction of armoured men-of-war and monitors; from the employment of torpedoes, and from the more extended use of hastily improvised cover. The war of 1866 in Bohemia as the campaign in which breech-loading firearms, although only of a comparatively low power and short range, first came prominently into notice. The Franco-German War of 1870-71 as the first campaign in which far-reaching, hard-hitting, and rapid-firing arms of precision were used; whilst in the late war we have, for the first time, long-range fire constantly and systematically employed. The fire tactics of the Turks, as far as can be gathered from published narratives, and as far as I can learn from eye-witnesses who saw much of the fighting, were extremely simple, and the reasoning upon which they were based is at all events intelligible and consistent. When the Turkish authorities provided their infantry with a weapon which has a range of over 3,000 paces, and which can be reloaded and fired fifteen times a minute, they recognised that it would be to make too great a demand upon human nature, or at all events upon Turkish nature, to ask that men, armed with so perfect a weapon, should always wait patiently until the object at which they were to fire should become distinctly visible, or until an assailant, advancing to drive them out of a position, should have arrived at comparatively close quarters, before they themselves opened fire. Accepting, therefore, the impossibility of persuading their men to always carefully husband their cartridges, not to fire until the enemy had arrived within what

used to be called "effective musketry range," they decided that it would be better to let their men endeavour to utilize, to the most extreme limits, all the power of the rapid firing weapons with which they were provided; to open fire immediately the enemy came within the very longest range of their rifles, and to fire as rapidly as possible; while, at the same time, since it was inevitable that such a line of action would involve the consumption of an enormous number of cartridges, every effort was made not only to amass an immense supply of ammunition, but also to insure that the men engaged should never run short of cartridges. Accordingly, immediately the enemy came within the very longest range of their rifles, the Turks, as a rule, opened fire, and endeavoured to keep up a continuous and incessant rain of bullets over all the ground occupied by the enemy; or upon which his troops, if concealed from view, were presumably drawn up; or over which they would have to advance to the attack, entirely regardless of the expenditure of ammunition involved thereby. And there can be no doubt—we have testimony upon the point from a host of witnesses, we have the testimony of the Russians themselves—that immense loss was frequently inflicted upon the Russian assaulting columns by these means, that, on more than one occasion, the advance of the Russian lines was not only retarded but absolutely stayed; that the attack faded away; that the onslaught was for the time at all events definitely arrested by this unaimed high-angle fire, before the Russians, armed with a weapon of inferior power, could arrive near enough to the defenders to reply to the fire which was devastating their ranks. General Todleben, in a letter to General Brialmont, states that the number of Turkish bullets which fell among the Russian ranks when they were still 2,000 yards away from the defenders' position was such, that divisions which at the outset numbered from 10,000 to 12,000 men, were speedily reduced to a strength of from 4,000 to 5,000; that, in other words, they lost half their effectives. Captain Kouropatkine, speaking of the attack upon Loftcha, states that at 2,000 yards from the Turkish position, Russian soldiers were struck down by the defenders' bullets, and that at 1,500 yards, men were falling rapidly on all sides; and General Zeddeler, who was present with the Russian Guard when it received its "baptism of fire" at Gorni Dubniak, states, that at 3,000 paces from the defenders' position, the Russians began to suffer loss, that at 2,000 paces men were falling rapidly, and as the attack progressed the reserves suffered nearly as much as the firing line. If it were necessary I could quote in detail a number of instances which confirm the truth of these statements; but the fact that the Russians suffered severe loss from the long-range firing of the enemy is so generally admitted, is so universally conceded, that it is needless, I think, to multiply proofs. I will, therefore, only cite a single case, which seems to me to be very instructive. Here is the narrative of a non-commissioned officer of the Vladimir Regiment, which, on the 11th of September, on the day of the last grand attack upon the Turkish lines round Plevna, formed a part of General Skobelev's command. During the forenoon of the day, this regiment had been ordered to

move up into a position in some vineyards and maize fields, two versts, or about 2,200 yards, away from the central Turkish redoubts on the Green Hill. The most advanced of the Turkish trenches were some 200 to 300 yards in front of this redoubt, and were therefore, presumably, from 1,700 to 1,900 yards from the Russian position. After describing these preliminary movements the narrator continues: "We had not been long in the vineyard when the Turks began to fire at us. Many of our men were wounded before the order was given for us to advance, and among them the Captain of my company, who was lying down among the vines. When at last we moved forward the bullets fell upon us like hail. They pelted upon us on all sides. Men fell on all sides, in the front ranks and in the rear sections alike. We had not gone more than fifty paces when the Officer of my subdivision was struck in the chest; he died two days afterwards. The other peleton Officer led on the company, but 100 yards further on he was hit too. We could not fire. Our Krink rifles were only sighted up to 600 yards, and the Turks were a verst and a half away." Here is an instance, related by an eye-witness, of what long-range fire can do; a company loses all its Officers, becomes naturally seriously demoralised, before it can arrive within a mile of the position it has to assault. The particular battalion to which this company belonged did not, it is almost needless to say, carry the Turkish trenches. In the words of the narrator, "long before we got near the trenches there was no one left to advance."

On the other side the Russians also, incited thereto doubtless by the losses they were suffering, endeavoured, on more than one occasion, to reply by long-range fire to the long-range fire which was galling them. The Krink rifles carried by the Russian soldiers being only sighted up to 600 yards, rough wooden sights were manufactured in some regiments and adjusted to the rifles, but as this expedient naturally could not increase the actual carrying-power of the weapon it advantaged the Russians but little, and they could not reply with effect to the fire which was devastating their ranks. One curious instance is, however, recorded of high-angle fire being used with signal success by the Russians. On the 23rd of August, on one of the days of the memorable struggle for the Schipka Pass, a Turkish force was assembled in some groves and thickets, some thousand yards away from the main Russian position. The Officer in immediate command of the section of the Russian line opposite to this hostile force, directed the men of the companies near him to raise the sights of their rifles for 600 paces, and to aim at the tops of some scattered trees, which stood half way between the Russian position and the wood in which the Turks were concealed. By this means so effective a fire was obtained that not only were the Turks unable to emerge from their woods, but were even obliged to fall back from the outskirts of the groves.

And not only on the actual field of battle, but also on the rifle range, it has been very conclusively proved that long range fire is exceedingly effective. Want of time prevents me giving details of experiments which have been recently made in Austria, France, Italy,



and Prussia, but I may mention that in some trials recently made on the Steinfeld Range, near Vienna, a party of men fired at wooden dummies set up 1,500 yards away, representing three guns in action. Of the total number of bullets discharged, 9 per cent. struck these targets; and in recent trials in Prussia, at 1,500 yards, 11 per cent. of the shots fired hit targets representing a company in line standing; 8 per cent. of the shots fired struck targets representing the company in line lying down; 22 per cent. of the shots fired struck targets representing a company in columns standing, and 16 per cent. struck targets representing the company in column lying down.

It must, therefore, I think, be admitted, that very serious loss may be inflicted upon an enemy by long-range fire. That, however, very much difference of opinion exists as to the advisability of sanctioning its employment, is notorious. The main arguments adduced by those who are opposed to its introduction may, I think, be briefly summarised as follows:—

First, that long-range fire necessarily involves the expenditure of a great amount of ammunition, and that, therefore, if men are allowed to open fire at long distances, they will be likely to run short of cartridges before the decisive moment of battle arrives;

In the second place, that long-range fire will be fatal to the offensive spirit of any force constantly employing it. That, in other words, it will be found impossible to rally forward a line of men which has once been allowed to halt at a great distance from the enemy to open upon him a long-range fire;

And thirdly, that if men are allowed to fire at long ranges, they will get into the habit of shooting wildly, and that, consequently, their fire will decrease in efficiency as the enemy draws near to the position.

Taking this last objection first, it seems to me that the evil dreaded will only make itself felt when what the Germans call the "fire discipline" of the troops is imperfect; or where Officers and men have not been sufficiently practised in the use of long-range fire. Up to the present time, long range fire has only been used by the troops of two armies, the French and Turkish, and of both of these, it is said that their fire decreased in efficiency as the enemy drew nearer to them, that the bullets fired by the defenders flew over the heads of the assailants as these latter advanced to closer quarters. Whether, however, this was always the case with the Turkish bullets seems to be doubtful. General Zeddeler, speaking again of the attack on Corni Dubniak, says that as the Russian attacking forces drew near to the position, the rain of lead which fell upon them was such, that none but those who saw it can form any conception of what it was like; and, if I remember rightly, an Officer, speaking in this theatre not long ago, described the Turkish soldier as looking very steadily at the enemy when he fired at him at short ranges. But, in any case, it must be remembered, that both by the French and by the Turks, long-range fire was employed in an unmethodical and reckless manner. There were no regulations prescribing how, when, or where it should be used; neither Officers nor men were practised in its use; the fire

discipline of the troops was most imperfect. But if the manner in which long-range fire should be employed has been carefully thought out and worked out beforehand; if appropriate regulations have been drawn up for governing its employment; if the fire of the men be kept under control, if, for instance, they fire by volleys only, or if the firing be independent, it be ordered to cease after each man has fired a certain number of rounds, it is difficult to see why the fact of men having fired at long ranges should afterwards make them shoot wildly at shorter distances. That there is more force in the first two objections cannot be denied; but they are both of them objections which apply to the use of long-range fire by attackers rather than to its employment by defenders.

How to bring up supplies of ammunition into the firing line; how to distribute cartridges to men actually engaged, is admittedly one of the most difficult at the same time that it is one of the most important problems which has yet to be solved in modern warfare. But, on the other hand, it ought to be no difficult matter to organize arrangements which shall ensure that a stationary line of defenders shall never run short of cartridges. The number of rounds fired by the Turks during the late war was enormous. In some of the more obstinately contested struggles of the campaign, each man is said to have fired 200, 300, 400, and even up to 500 rounds; and yet I do not find a single instance recorded of the Turks running short of ammunition. Immediately a shelter trench was excavated, receptacles were hollowed out for ammunition barrels or boxes, these were kept constantly filled with cartridges, and from these the men helped themselves.

The objections, then, to the use of long-range fire apply rather to the attack than to the defence, and, therefore, it may be concluded, I would contend, that in future, long-range fire will be employed by every defensive force, especially as, by its employment, and in no other way, can loss be inflicted simultaneously upon all the lines—upon the skirmishers, supports, and reserves—of an attacking force. In his "*Précis of Modern Tactics*," Colonel Home states:—"It is possible to bring up the main body of an assailing party in a much closer formation than is often supposed, because the fire of the defender will be mainly directed upon the assailant's skirmishers." And von Scherff also argues that, "the fire of the defender will be diverted as the attack progresses from that portion of the attacking force which comprises the main body, or true assaulting party, by the necessity of checking the advanced line of the attackers, and it is upon this diversion of the fire from the main body that the possibility of an attack mainly rests." But, if the defensive force be disposed—as the Turks frequently were—in two or more lines, and if, by taking advantage of sloping ground, these lines are posted so that the men in rear can fire with safety over the heads of the men in front, the troops in the rear lines may keep up a high angle and exceedingly effective fire upon the supports and reserves of the attacker, whilst the men in the front line confine their attention to checking the advance of the skirmishers or foremost fighting line. But if, actuated by these or other considerations, the defender opens

long-range fire, the assailant must reply to it. In several articles on the battles of the late war, the Russian method of attack is severely criticised. The Russians are blamed for pushing on to the attack whilst still a thousand yards or more away from the defenders' position—for rushing forward to the final onslaught before the way had been sufficiently prepared for the fire of skirmishers. In other words, they are censured for not employing long-range fire. That they did not do so was owing to the inferiority of the weapons they carried. When once they could open fire, the men advanced much more cheerily. A private in the Russian Army, speaking of one of the attacks upon Plevna, said:—"This part of the advance was terrible; men were "struck down on all sides, and we could not reply. When once we "opened fire, it was not so bad; we were so busily firing at the enemy "that we did not think much of his bullets."

To conclude, then, this portion of the subject, long-range fire will, I would contend, be in future employed by every defensive force. To lend a moral support to his advance, as well as with a view of inflicting serious loss upon the enemy, the assailant must reply to this long-range fire by long-range fire, and therefore, however cogent may be the arguments urged against it, long-range fire will in future be largely employed. That this is the view of the matter taken by military authorities on the Continent may be inferred from the fact that, in the latest published musketry regulations for the Austrian and Prussian Armies, instructions are laid down for using long-range fire, or, in other words, its employment is recognized and sanctioned; and an article recently published in the organ of the French General Staff concludes with these words:—"It is time that those who object to "long-range fire should nevertheless range themselves by the side of "its convinced partizans, as at all events resigned partizans, for it "must not be forgotten that no advantage will be obtained from long-range fire, but that, on the contrary, grave inconvenience will result "from its employment, if we practise it for the first time when its use "is imposed upon us on the field of battle. The employment of long-range fire is too difficult and too delicate a matter to be improvised."

Intimately connected with the question of long-range fire is that of the supply and distribution of ammunition to men engaged in action; but this subject has been so recently discussed in this theatre that I do not propose now to enter upon it at any length. Since the occasion referred to, however, an article bearing upon the matter has been published by General Zeddeler, and therefore, perhaps, it may not be uninteresting to note the deductions derived by that Officer from the personal experience he gained during the late war, especially since, having previously accompanied the Staff of the Prussian Army during seven months of the campaign of 1870 and 1871, General Zeddeler was exceptionally well qualified to draw conclusions from what he saw. In the first place, after pointing out the absolute necessity of largely increasing the number of ball cartridges available in the Russian army during action, and which it may be remarked is much the same as in our own, General Zeddeler strongly insists upon the advisability of giving to the men from the outset a greater number of rounds,



suggesting that each man might carry 105 rounds, namely, 60 in his pouch, as at present, and an additional 45 in his havresack, while, at the same time, recognizing that there is a limit to the burden which it would be wise to impose upon a soldier, General Zeddeler recommends a corresponding diminution of his general equipment. The first or immediate reserve of small arm ammunition, consisting of 25 rounds per man, should be carried, General Zeddeler warmly advocates, on pack animals; and, taking 2,000 rounds of ball cartridge as the load for each animal, 30 such animals would be required to carry the first supply of ammunition for a regiment of four battalions. The second and larger reserve, consisting of 75 rounds per man, should be carried, General Zeddeler recommends, in carts or waggons. These waggons should be attached to regiments, and, on the regiment to which they belong going into action, they should be drawn up in the immediate neighbourhood of the site selected for binding up, in the first instance, the wounded men of the regiment, as the constant communication between this spot and the front would facilitate forwarding ammunition from the waggons to the men actually engaged. The waggons should be emptied in succession, and, as soon as the supplies in one are exhausted, it should be sent to the rear to be replenished. The pack animals should be attached, two to each company, and should each be accompanied by two men. The Captain of every company should look after the animals attached to his command, and should be held responsible that they always keep close up to the men, and, as soon as all the cartridges carried by one animal are served out, it should be sent back to the waggon to bring up more. In this way, every man going into action would have immediately available 205 rounds of ball cartridge: namely, 105 carried by himself; 25 rounds carried by the pack animals of his company; and 75 rounds carried in the waggons of his regiment.

Passing on now to the subject of intrenchments. It did not require the experience of the late war to teach us that a trench of even the most simple profile, adequately garrisoned, is, under certain, easily-fulfilled conditions, practically unassailable by, at all events, a frontal attack. This truth was enunciated after the American War by Major-General Barnard, of the United States Engineers, in a Report on the defences of Washington, and has since been amply confirmed in more recent campaigns. That the Turks fully appreciated the advantages to be derived from the judicious employment of hasty intrenchments and field fortifications may, I think, be gathered from the published accounts of their defensive battles. Immediately Turkish soldiers were ordered to occupy a position, they at once endeavoured to find cover for their deployed lines by utilizing the features and accidents of the ground, supplementing this natural cover, where necessary, by scooping out what in the first place were very shallow shelter trenches. As soon as possible these trenches were extended and enlarged; the excavations were deepened, the parapets increased in thickness and height. As time went on, traverses were constructed to screen the defenders against oblique or enfilade fire; receptacles were hollowed out for food, water, and ammunition, so that neither hunger, thirst,

nor want of powder might oblige the defenders to even temporarily quit their posts; and, finally, bomb-proof cover was provided. If the position was held for any length of time, redoubts were constructed on the most commanding points of the ground, armed with guns, and traced so as to give a flank fire along the front, or a cross fire over the ground in advance of the longer lines of trenches. In the construction of these redoubts again, the care taken to provide cover for the defenders against hostile fire, not only against direct or horizontal fire, but against enfilading, oblique, or curved fire, is ever the most noticeable feature. Where the works were exposed to artillery-fire, where it was to be anticipated that they would be subjected to a prolonged bombardment, or where it was to be expected that guns of a larger calibre than ordinary field-pieces would be brought against them, the parapets were made 18 to 20 feet thick, to secure the defenders behind them from the direct and horizontal fire of the enemy. Huge traverses, of very substantial profile, were constructed across the interior to screen the defenders from oblique and enfilading fire; and, finally, behind these traverses, in rear of the parapets, and sometimes under the counterscarps of the ditches, bomb-proof accommodation, of a very admirable type, was provided. The small amount of damage done to the garrisons of these works by the Russian artillery, even when this latter had been reinforced, as it sometimes was, by siege guns and guns of position, proves how excellently well the precautions taken answered the end in view. As one of many instances which go to prove how effectual was the cover provided, I may mention that it has been stated to me that on one occasion more than 300 shells struck or fell within a single Turkish redoubt, and that only five of its garrison were wounded.

With regard to the supply of tools for the construction of intrenchments, the Turks do not seem to have had any regularly organized system of transport. Sometimes the tools were carried by pack animals, sometimes they were conveyed in waggons or carts, sometimes borne by the men themselves; but some way or other the necessary implements seem to have been always forthcoming when they were wanted. On the other hand, from the Russian side, we hear constant complaints of the want of intrenching tools. Captain Kouropatkine, speaking of the attack on Loftcha, states "the necessity for rapidly intrenching ourselves in the position we had won, rendered the insufficiency of the intrenching tools of the Russian Army very apparent. In order to obtain the necessary number, tools had to be collected from different corps, and when the work was finished they were not always punctually returned." Several other cases might be cited to show how severely the want of intrenching tools was often felt by the Russians. On one occasion it is stated that a line of men, severely galled by the enemy's fire, were so anxious to cover themselves that they loosened the earth with their bayonets and swords, and endeavoured to pile it up with their drinking cups and hands; and on another occasion a body of men, unable to construct a covering mound of earth, piled up a parapet of corpses, using for the purpose the bodies of friends and foes indiscriminately. But, although the late campaign has thus demonstrated, perhaps in a more striking

manner than any former war, the fact that intrenching tools form almost as necessary a part of the equipment of an army as rifles themselves, it has thrown little or no light upon the way in which these intrenching tools should be conveyed; though it may be noted that Captain Kouropatkine expressed a very decided opinion against giving them to the men themselves to carry. The first thing, he notes, which a man throws away when he becomes distressed or when he wishes to get forward more rapidly, is his intrenching tool; and, therefore, if these are given to the men they are very likely not to be forthcoming when they are wanted.

But, further, the late campaign shows, I would submit, that it is not sufficient merely to have organized arrangements which will ensure that a sufficient supply of intrenching tools shall always be forthcoming. More than that must be done. The men must have been taught, by previous practice, how to use them, the Officers of an army must understand how to intelligently supervise and direct their employment. From remarks made here and there, from hints dropped now and again rather than from any outspoken statements on the subject, it is very evident, or at all events there is strong reason for surmising that on several occasions, even when the Russian soldiers had intrenching tools, they could not use them to advantage. When detachments of Engineers were present to design, direct, and give a lead, the work of intrenching seems to have been performed fairly well by the Russians; but when the ordinary line soldier—in other words the unskilled, untrained workman—was thrown upon his own resources, the work does not seem to have progressed in nearly so satisfactory a manner. General Skobelev, in some of his reports, speaks of the way in which the work was done when pioneers were present, and Captain Kouropatkine speaks of the assistance rendered by Officers who had passed through the Russian military schools, in a way from which it may be inferred that when these trained Officers and men were absent, the results achieved were not so satisfactory. Neither can this be a matter for surprise. No vast amount of knowledge is required to enable an Officer to design or superintend the construction of such hasty intrenchments and simple field fortifications as may be employed on the field of battle or in the first stages of defence to strengthen a position; but, nevertheless, unless the few simple principles which should govern the construction of such works are fully appreciated, there is, it has been shown by experience, by the experience of the late war among others, a tendency to bungle over what seems to be, and what really is, a very simple task. On the other hand it would be an equal mistake to suppose that committing to memory a mass of details, learning by heart a number of dimensions, will fit an Officer to design or construct hasty intrenchments. In a work on "The Defence of Outposts," which is now considered old-fashioned, but which nevertheless contains much which may still be read with advantage, it is stated, "If the main conditions to be observed in defending a post are kept in view, there will be a natural tendency for the minor details to come right of themselves; provided these, the main principles, are at home when wanted, an Officer may safely trust to his



“common sense suggesting more on the spot than memory can supply.”

Passing on now to the last of the deductions I enumerated, it is impossible to attentively study the accounts of the battles and other occurrences of the late war without being struck by the feebleness of the part played by the Russian artillery during the campaign. That the effect produced by artillery fire is due as much to the moral as to the material damage occasioned by it is a very old proposition. In the campaign in Bohemia in 1866, of the total losses suffered by the Austrians, only some 3 per cent. were occasioned by artillery fire; over 90 per cent. of the total losses were caused by the bullets of the needle gun, 4 per cent. by cold steel, and 3 per cent. by artillery fire. And, during the battle of Gravelotte, of the total Prussian loss, whilst over 90 per cent. were caused by bullets, less than 5 per cent. were caused by artillery fire. Nevertheless, it was expected, when the late war began, that the Russian artillery, far superior in the number of its guns to that of its adversary, would influence, in a very decisive way, the operations of the campaign; but, as a matter of fact, it contributed little or nothing to the success achieved. When the second onslaught was made upon the Turkish lines round Plevna, a large number of Russian batteries were in action for several hours against the Turkish position before the infantry advanced to the assault, and prior to the last grand attack more than 300 guns, amongst which were some of unusually large calibre and great power, bombarded the Turkish lines for, I think, four days and five nights before the attack was made, and yet, on both occasions, the attack failed. Again, during the attack on Gorni Dubniak 60 Russian guns concentrated their fire for several hours upon a single Turkish redoubt, armed with four guns only, but did so little execution that several successive attempts to carry the work by storm were subsequently repulsed. That the Turkish works were admirably designed to withstand artillery fire I have already pointed out, but still, the fact that the Russian artillery, on these occasions, achieved nothing worthy of mention must be, in part, ascribed to the faulty manner in which it was handled. The nature of the mistakes committed by those who were responsible for the management of the Russian artillery is, I think, very clearly indicated by Captain von Trotha. In the first place, the batteries present were, as a rule, uniformly distributed along the whole line of battle or front of attack, no attempt being made to keep in hand a number of guns to employ against decisive points. Secondly, the guns opened fire at long ranges, and always directly against the enemy's works, no attempt being made to sweep his lines with oblique or enfilade fire. And, thirdly, it was but seldom the Russian batteries advanced as the infantry moved forward, and consequently the fire of the Russian artillery was very frequently masked immediately the infantry began to advance.

With regard to this last criticism it may be noted that on the few occasions on which Russian batteries did advance into the zone of the musketry fire of the defenders they were generally obliged to fall back, on account of the losses they suffered in men and horses. This fact is

noticed by Captain von Trotha; but none the less does he insist upon the necessity of batteries pushing forward with an attack, in order that they may be at hand in readiness to seize, by skilful and daring manœuvring if necessary, any opportunity which may present itself of co-operating in the attack. That in so doing they may, and probably will, suffer loss is admitted; but answering in anticipation this objection which may be urged to pushing forward guns into the fore-front of battle, Captain von Trotha argues, with much reason, that a single battery which, from an advanced position, has been able to fire with decisive effect for five minutes before being put out of action or being obliged to retire, will have contributed more towards the general success than ten batteries, which from a retired position have kept up during the whole day a well-aimed, it may be, but nevertheless ineffective fire.

Finally, the small amount of damage done to the Turkish works by the Russian artillery would seem to indicate the necessity of supplementing the present field artillery of an army with guns of larger calibre and of greater power. At 2,500 yards, the 4-pounders of the Russian artillery were unable to make any impression at all upon the Turkish works; they did absolutely no damage whatsoever to the intrenchments of the defenders; and even the 9-pounders did very little damage. That a recognition of the necessity of thus adding to the artillery of an army guns more powerful than those in present use was forced upon the Russian leaders by the events of the late campaign may, I think, be inferred from the fact that the largest of the two classes of field-pieces which are at the present time being manufactured for the re-armament of the Russian artillery has a calibre of 10·7 centimetres, or 4·1 inches, a calibre, I believe, larger than that of any gun in use in any European Army, and throws a shell weighing 28 lbs.

As I have now reached the limit of my time, I must conclude the few remarks I have ventured to address to you, and in which I have only attempted to indicate in the baldest manner a few of what seem to me to be the most important tactical lessons of the late war.

Captain TROTTER, R.E.: Perhaps I may be permitted to say a few words, as I had the honour of serving under Sir Arnold Kemball in Asia Minor throughout the campaign. There are one or two points I noted in the course of the lecture which I should like to allude to. The lecturer said that, if there were two lines of intrenchments, he thought it practicable that the front line might be firing upon the enemy's skirmishers while the rear line was firing upon the supports or reserves. I think that would hardly be practicable. I think both lines would be much more inclined to fire upon the enemy's skirmishers (who would probably be the only people they could see), than to think of firing upon the supports or reserves. Then another point about the ammunition. At the first battle at which Mukhtar Pasha was victorious, the men were provided each with 150 rounds of ammunition; they carried 50 rounds in their pouches, and the remaining 100 rounds, some, like the Circassians, in pockets made on the breasts of their tunics, and others in their havresacks, mixed with their biscuits, or in any other place where they could find room. In addition to what was carried by the soldiers themselves, there were 30 ponies for each battalion (the very arrangement the lecturer suggested as being the best possible), each carrying 2,000 rounds, and there is no doubt it was a very successful arrangement. I saw on some occasions the ponies being actually taken up to the lines of skirmishers to provide them with fresh ammunition. An objectionable point

was, that the ammunition was all carried in the original boxes which came from America, and these had to be broken open and the cartridges distributed under a heavy fire, not a very easy thing to be done. No doubt that might be improved upon. As to artillery, it has been said that the Russian gunners throughout the war fired at very long ranges. There is no doubt that, in Asia Minor, up to the very end of the war, that was invariably the case; but in the fatal battle of Alaja Tagh, I understand that the Russians brought their guns up to within 1,500 yards of the Turks. It was the first time they had done so; and it gave rise to a report all over the Turkish Army that the Russians had been supplied with Prussian artillery Officers. I believe the real fact was, that the guns belonged to the division of Grenadiers from Moscow, which had just arrived at the seat of war, and whose Officers were better educated and more efficient than those of the other divisions which had previously been taking part in the war. Their guns were brought up to within about 1,500 yards of the Turkish lines, and fired with tremendous effect. The same thing happened at the battle of Deveh Boyun in front of Erzeroum; the guns were brought up very much closer than I had ever seen before,<sup>1</sup> and were very effective, especially in the centre, where the Turkish troops wavered and retired, without awaiting the attack of the Russian infantry. As regards the loss caused by the artillery, I made an estimate that, at Kars, the Russians fired 150 shells for every casualty that occurred. While I was with Ismail Pasha's force in the Erivan district, on one occasion, I saw 60 or 70 shells burst in the immediate vicinity of a Turkish field battery. I went down to ascertain the number of casualties, and I found there had only been one man touched.

Admiral SELWYN: I think, if I had no other observation to make, I should be very much inclined to get up and compliment the lecturer for one of the clearest and most instructive lectures that has ever been given at this Institution. Not only has it been delivered in a manner which deserves the highest praise, but the points which have been touched are those which must receive the most close attention in our Army in a very short time. There is one change which is now on the point of being made with the cartridge. We are now going at last, I believe, to have a solid cartridge case—at least, a solid drawn cartridge case—and I hope no mistake will be made about that, and that the words which have been spoken here to-day may find their echo in the breasts of those who have to decide the matter; since the cartridge which might be made is 10 pounds in the 100 lighter than the cartridge that is now made. That is a very important point with reference to how many cartridges a man can carry; and due attention, I consider, has not in our decisions been paid yet to the fact that the cartridge is really the first thing to consider in every breech-loading arm; that whereas you may use almost any form of rifling, you cannot carry the quantity of ammunition that you ought to carry if you do not make the cartridge-case as simple as possible in its construction. It ought to be incapable of galvanic action between its component parts. It ought to be able to stand any amount of rust or damage to the interior of the chamber without being thereby incapacitated from withdrawal, and, most of all, it ought to be the very lightest cartridge-case possible, which will produce the effect we want from it. I was in Turkey during the whole of last year, and I noticed particularly that the supply of cartridges given to the Turks was both highly efficient in itself, and provided for much larger expenditure than had ever been thought probable in any other army before. The Turks were also our masters in the art of intrenching. Vauban confesses he learned every lesson he ever knew from the Turkish system of intrenchments, and they have not yet ceased to employ their spades as thoroughly well as they did in Vauban's days. Osman Pasha, who was the unaided engineer at Plevna, showed that the military school at Constantinople can turn out equally good men for all practical purposes with any school in the whole of Europe. They have a thorough knowledge of the use of the spade by a whole army, such as, I am sorry to say, is not yet thought necessary to be given to all our soldiers, and they carried, wherever they went, sufficient intrenching tools for that purpose. There is one essential thing to be noted in the general carrying of an intrenching tool by each soldier, viz., that it

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<sup>1</sup> I was not present at the battle of Alaja Tagh.



must not increase in any manner the weights he now carries. This can only be done by economising some of the useless weight which soldiers now carry. If a rifle is made up of 4 lbs. of wood in the stock, and 4 lbs. of steel or iron in the barrel, there are nearly four useless pounds for all practicable purposes there, and if that useless weight is partly replaced by a useful intrenching tool, under such circumstances it is very unlikely that the soldier will ever throw that intrenching tool away. The ordinary intrenching tool is an incumbrance to him, and he is very likely to throw it away: for that reason, I never have been an advocate for the complicated and curious weapons which have been from time to time introduced under the name of intrenching tools. I think this can be done, and ought to be done, during peace, that we may be prepared for war; and I believe, however we may have been relieved at the present moment from the immediate fear of a war, such a relief really means nothing else than the extension of the great war of the future, which every one who studies European politics must see is coming.

MR. C. B. NORMAN: There is one point I should venture to remark upon, namely, the carrying of intrenching tools. Certainly the Turks had no very good method of carrying them. They were sometimes carried on the back of pack animals, and sometimes were close forward up to the front when they were wanted. A system of carrying these tools was instituted in India, which certainly worked very well. They were carried in wooden frames, very similar to the crates in which china is packed in England, with lattice-work bars. Each camel was able to carry fifty pickaxes and fifty shovels in this way with the handle running vertically down, and the bar of the pickaxe over the top. By this means the intrenching tools were always kept up with the battalions. The camel is of course a very awkward creature, especially under fire, but I think smaller crates were used on more than one occasion which were put on the backs of mules, and certainly they would be a very great advantage to any enemy operating in a mountainous country as in the Balkans or in Armenia, if a certain number of mules, say two to each company, could be spared to carry intrenching tools, just as I believe they will be spared for the purpose of carrying ammunition.

As to the Russian artillery fire, I cannot help thinking it was greatly owing to the want of instruction on the part of the Officers that so little damage was done. I remember being once with Sir Arnold Kemball, and seeing shell after shell bursting absolutely underneath the gun when the crews were endeavouring to drag it out of action. On one occasion we saw three men on the ground, and made up our minds that they must be knocked over, but after looking about they jumped up and dragged the gun out of action. I do not think there was a single man touched in that battery, but that was entirely owing to the percussion fuze failing to act properly. Perhaps that is a lesson that may be lost upon us; percussion fuses are certainly nothing like time fuzes.

THE CHAIRMAN: I consider myself very fortunate to have been invited to preside on this occasion, to hear the views of Captain Needham. I think the diligence with which he has mastered his details, and the clearness with which he has expressed his conclusions, have resulted in a very interesting lecture, entitling him to the best thanks of the meeting. His conclusions are quite in accordance with my experience in Armenia. It is scarcely fair to compare European troops, regularly disciplined, with raw Turkish levies who were suddenly called into the field in large bodies without the slightest organization, and who had had no opportunity whatever of ball practice. It is not surprising, therefore, that in long-range fire they should have wasted an enormous quantity of ammunition altogether out of proportion to the effect produced, but at whatever cost the ammunition was forthcoming, and the effect produced was generally decisive. As regards the supply of ammunition, and the mode of providing intrenching tools, the Turks were no doubt dependent on rule of thumb arrangements, but it is a fact nevertheless that their ammunition, except at the first battle, was always ready when required, and the intrenching tools were at hand. We hear more, I think, of shortcomings in these respects in the better organized and well-disciplined Russian Army. Be this as it may, however, it is certainly marvellous that the Turks should have effected so much in spite of the defects of organization. I need not detain the meeting with any further remarks before proposing a vote of thanks to Captain Needham, except to notice one

point which I think important—I mean the mode of carrying ammunition by the soldier, as improvised by the Turks, which proved very efficient. Captain Trotter has already referred to it. The pouches being insufficient, Mukhtar Pasha encouraged his men to sew slips of cloth on the breasts of their coats with pleats, in the Circassian fashion, to contain cartridges, also to provide themselves with broad belts of cloth or leather similarly fitted. By this means he succeeded in distributing the weight over the body, affording also some sort of protection against the enemy's fire, and enabling the soldier to carry from 100 to 150 rounds of ammunition or more with greater ease and advantage than when tumbled in bulk into his havresack, and mixed up with its contents.

## LECTURE.

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Friday, 5th July, 1878.

GENERAL SIR WILLIAM J. CODRINGTON, G.C.B., &c., Vice-President, in the Chair.

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### ON THE ADOPTION OF THE NAVAL AND MILITARY SYSTEMS OF EUROPE BY CHINA AND JAPAN.

By Captain CYPRIAN G. BRIDGE, R.N.

MY first duty this afternoon is to explain, and, if necessary, apologise for coming forward as a lecturer in this theatre a second time in the course of one annual session. I hope my audience will accept my assurance that my appearance here to-day is due only to an invitation, more than once repeated. The subject to be brought before you is not of my own selection, but was proposed to me in the invitation mentioned, and no one can be more fully persuaded than I am of my inability to handle it effectively. To do it perfect justice, it should be treated by a competent scholar of the Chinese and Japanese languages, by a student of the abundant military literature of those tongues, and by a person conversant with the internal and foreign politics of the two countries. To not one of these qualifications do I make the smallest pretence. I have, indeed, spent some time in both China and Japan, and I have also had some opportunities of witnessing the progress they have made in their adoption of the naval and military systems of the West, and I have diligently searched through literally scores of volumes for notices of the condition of their armaments at various periods of their history, as recorded by foreign observers; but beyond this I have no claim to be considered in any way an authority in the matter. The subject—though, as I have said, not one of my own choosing—is an important and interesting one, and I regret, for many reasons, that it has not come to be taken up by one of the many highly competent gentlemen whose names are well known in the far East, and who are now in this country.

An inquiry into any of the institutions of either China or Japan is likely to possess an interest of a highly peculiar nature, and depending on different causes in the case of either nation. The astonishing antiquity of the Chinese Empire must render extremely interesting an



examination of any department of its polity. A thousand years before the half-mythical period when the rape of Helen was avenged by the siege and destruction of Troy, China had attained a considerable national position, and was in possession of a settled government. Within the space of time that has since elapsed, empires have risen and fallen, others have been erected on their ruins, to fall in their turn, and great revolutions of race, in politics, and in religion have changed the aspect of the world elsewhere; but with her, language, institutions, and national character have maintained a remarkable, unquiet indeed occasionally, but still unbroken continuity. As has been eloquently said of her, she is "a venerable structure, the last remains of the fabric of empire reared by the hands of the men of olden time." The antiquity of Japan, respectable as it is, seems insignificant by the side of that of her neighbour nation; but there is something about her so attractive, the scenery of the country is so beautiful, the climate so lovely, the history so romantic, and the manners of the people so polished and engaging, that an investigation of any matter concerning her exercises a fascination over the minds of all who have enjoyed the advantage of visiting her shores, or to whom descriptive accounts of her are familiar. Both nations, for many generations, evinced a strong repugnance to submit to foreign instruction, and, in the case of one—China—that repugnance has been overcome as yet only as regards advance in the path of naval and military progress, which—regret it as we may—few here will be disposed to deny is, in our own time at least, an important branch of high statecraft; whilst, in the case of Japan, movement along this path is but part of a wholesale change of system and imitation of the institutions existing in the western world.

To simplify the method of the inquiry which I have been asked to undertake, it will be better to examine the advancement of each country separately, in the improvement of its naval and military system under the influence of foreign instruction. For each, then, it will be well to, first, give an account of the condition of its armaments at the epoch at which Europeans first began to be intimately acquainted with the concerns of the far Asiatic East. Secondly, to call attention to the progress made by them, as noted by foreign observers. Thirdly, to ascertain their condition during our several conflicts with them. And, lastly, to glance at the progress they have made up till now, and the position in which either country stands at present.

Our earliest intimate knowledge of China we owe to the accounts sent home by the Roman Catholic missionaries. To them and to their contemporaries that empire seemed, and rightly seemed, to have attained a marvellous pitch of culture and enlightenment. At the present day, there still exist in many parts of China obvious traces of good order and refinement, to which the Europe of Charles V or Elizabeth must have failed utterly to find a parallel. Gigantic public works, of pomp or utility, an ancient literature in the native tongue, an active and wide-spread commerce, remarkable mechanical ingenuity and skill in the useful and decorative arts, as well as a highly organized system of

government, and an orderly and pacific population, formed a combination to be looked for in vain in the kingdoms of the West. Europe, torn by conflicts waged in the name of religion, or because of the ambition of dynasties, could not claim great superiority over the newly visited empire, even in the matter of warlike science. Certain weapons she indeed possessed, such as cannon and portable firearms, rude and imperfect as both these were, which China, we may concede, had not learned to use. But in organization and discipline, the eastern country was, and continued to be for many years, far in advance of even the foremost European military states. The Jesuit Navarrete, writing in the seventeenth century, tells us that, having had personal experience of a Chinese Army on the march, he would far rather have to traverse two Chinese Armies than one of Spaniards. In his celebrated work, the "*Histoire Philosophique et Politique*," &c., published a hundred years ago, the Abbé Raynal—summing up the accounts of Chinese polity due to the diligence of the missionary visitors—noted the absence of a warlike spirit amongst the Chinese, but expressly asserted that its non-existence was not incompatible with a self-devoting courage. Many incidents of our own wars with them show that, if they did not know how to fight, they at least knew how to fall courageously; and, in the course of the long struggle, now apparently approaching its issue in Kashgaria, the devotion of many commanders of beleaguered Chinese garrisons—who preferred self-destruction to surrender—has rarely been surpassed, even among the warrior races of the western world; so that the submission to the restraints of military discipline, which rendered a Chinese force so orderly, and therein so different from a contemporary European one, was not due to any pusillanimity on the part of its members. The unwarlike spirit of the nation showed itself in a horror of war for war's sake, and in an enlightened preference for the arts of peace over that military glory which is but too often accompanied by bloodshed, rapine, and pestilence. "Contumelious, "beastly, madbrained war," as Shakspear stigmatises it, was to be dreaded as interfering with the prosperity of the people, not because they were afraid to risk their lives in it. Unwarlike as it was, the nation was not unmilitary. Several military maxims, long current in the country, have been made known to us. "An Army is intended "to defend the people, and not molest them," must have sounded strange in the ears of Europeans, who might have had personal experience of the conduct of Tilly's and Mansfield's troopers. "The Army "may be a hundred years unemployed, but not a single day un-"prepared," summarised the whole theory of a standing army, ages before our "bluff King Hal" had called his Yeomen of the Guard into existence, and was probably not unthought of at Berlin, between La Belle Alliance and Koeniggratz.

So in the government of the Empire, under both its native sovereigns and the present intrusive reigning house, a separate branch of the administration was charged with the duty of superintending the defensive forces as is the case in the countries of modern Europe and in America. One of the boards into which the supreme Government was divided, was and is the *Ping-pu*, or Board of War; War Office, as

we may term it. Under it was the superior military tribunal, or *Yong-Ching-pu*, which seems to have exercised the functions of the head-quarter staff, and was the vehicle for the transmission of the orders of the supreme authority, with whom the decision on great questions of military policy lay, to the executive departments or *bureaux*, of which there were five seated at the capital. Since the Manchu dynasty has usurped the throne there have been in reality two distinct Chinese Armies; one the Banner force, and the other the *Luh-Ying*, or troops of the Green Standard. On the organization and distribution of these bodies of men a series of admirable essays were written more than twenty years ago by Her Majesty's present distinguished representative at the Court of Peking, Sir Thomas Wade. They are to be found in the *Chinese Repository* for 1852, and I strongly recommend the perusal of the exhaustive account of the Chinese Army contained in them to any person interested in the subject. The qualifications of their eminent author, as soldier, sinologue, and diplomatist, give to them an authority which no other writings on the same theme can well lay claim to. The Banner force comprises both a standing army and a body of household troops. It may be roughly, but with sufficient accuracy, divided into palace satellites, Imperial Guard, and garrisons for the capital and several of the chief cities of the Empire. It is divided into eight corps, or banners, and in its ranks are Mongols, Manchus, and Han-kiun, or descendants of those Chinese who forsook the native Ming dynasty at the invasion and went over to the cause of the usurper. These last are spoken of in the accounts of the missionaries as "Tartarised Chinese." Each corps contains archers, musketeers, and artillery, and there is also a large body of cavalry belonging to it. Its nominal strength has been roughly estimated at from 100,000 to 130,000 men; all the males of Tartar families dwelling in or near the capital being in a sense enrolled in it. It is, however, very doubtful if it could turn out in anything like that number. This *corps d'elite* has yielded, in its organization, drill, and equipment, less to the influence of foreign ideas than the other portions of the Chinese Army, and the long-bow and the cross-bow are still its favourite arms. I have myself seen considerable bodies armed with those antiquated weapons going to and returning from the practice ground outside the walls of Peking; where it is no uncommon sight also to meet with some dashing young Officer of the Guards driving out to the butts in a springless cart, the ordinary street-cab of Peking, from under the arched covering of which peep out the end of a bow and a quiver well filled with arrows.

The troops of the Green Standard are almost entirely Chinese. A few Officers above the rank of subaltern are Manchus. This force has been, at different times, variously estimated at from 600,000 to 800,000 men. The numbers on the lists probably do not fall much short of the larger total; but many of them only turn out for duty when actually required. "It is," says Sir Thomas Wade, "rather an immense constabulary than a fighting Army." Differing from the Banner force in one important respect it is under the orders of the provincial mandarins. The Government of China is in great measure local.



and provincial in its character; each province having separate revenues, a separate army, and—if on the sea-board or traversed by great rivers—a separate naval force. To this we may with all appearance of probability attribute that extraordinary want of uniformity in organization and equipment which is to be observed in different bodies of Chinese troops and different squadrons of armed vassals. Within the course of a short journey, bows and arrows, breech-loading rifles, spears, sword bayonets, shields, Krupp guns, matchlocks, and antique smooth-bores may all be seen in use both on shore and afloat. And I have noticed, not once but often, man-of-war junks and steam gun-boats flying the dragon flag lying at the same anchorage. A progressive Governor-General, like the eminent Li-Hung-Chang and his reputed rival Tso-Tsung-Tang, establishes arsenals for the construction of modern weapons and ships of European model, whilst a conservative contemporary adheres to the fashions of his ancestors; both being little hampered by orders from the Central Government. The troops of the Green Standard are, or were, divided in 1,202 *ying* or battalions, and they were distributed through forty-one different stations.

Recruiting for both branches of the Army, we learn, is not attended with many difficulties. The Banner-men are hereditary soldiers; and the ranks of the Green Standard are filled by volunteers who, as one account informs us, are often so anxious to enlist that they give presents to the mandarins to allow them to enrol themselves. When not on duty they are permitted to work at their trades, and thus earn an addition to their regular pay. The Officers often, perhaps generally, rise from the ranks; but the system of competitive examinations is in force for the military, as well as for the civil service of the Empire. The examination, unlike that in some enlightened countries which have copied it with so much self-congratulation, is not simply a literary one. In China, the original home of competitive examinations, where cramping the feet of ladies and the intellects of those who desire to serve their country are both in fashion, they have not gone quite so far as to make a rule that that which is a good test for selecting pupil-teachers is by itself an equally good one for selecting naval and military Officers. A part of the examination is designed to test proficiency in riding and martial exercises. As the country makes farther “progress in the art of war,” and comes more under the influence of western enlightenment, we may hope to see the scholastic test alone retained as evidence of fitness for the least scholastic of professions. But they are not an illogical people, and when they do this they will probably also make superior proficiency in knotting and splicing an essential qualification for a college tutorship. The examinations are held periodically, at different head-quarters. What in Western Europe is called “interest” is nevertheless not unknown in China, and Sir Thomas Wade states that the claims of parents of hereditary rank for appointments are admitted.

The arms of the troops when we first learn much concerning them were swords and lances, the bow and arrow, the cross-bow and bolt; and we are expressly told there were “few musketeers.” The match-

lock is said to have been introduced into the Chinese Army under the Ming Emperors early in the sixteenth century. It was probably not inferior to that in use in Western Armies at the time. The sword was peculiar; it really consisted of two in the same case or scabbard, one of which was held in each hand, and was manœuvred in an extraordinary manner by whirling the arms, the soldier all the time going through a sort of acrobatic performance of leaps and contortions of body. This quaint sword-practice is still in existence. Captain Colomb may remember my accompanying him one day, first to witness some Chinese soldiers firing Remington breech-loaders at a target, in accordance with the Hythe regulations, and then to see some of their comrades wildly flourishing their two swords to the sound of a *tom-tom*; an instance of the anomalous condition of things military in China of which mention has been already made.

It was long believed in Europe that the Chinese used cannon ages before it was known amongst us. I have seen statements to that effect in several works which I have consulted. Marco Polo is credited with the assertion that, as far back as the thirteenth century, it was used, if not by them, at least against them. I confess I cannot so construe the meaning of any passage in the record of his travels. Sir John Barrow says that in their old works on tactics, mention is made of gunpowder for use in war only as a means to annoy an enemy by springing mines, and that they contain no allusion to cannon. On the whole, the balance of evidence is in favour of the view that they learnt the use of cannon from foreigners. In 1621, three pieces were presented to the reigning Emperor of the then existing Ming dynasty by the city of Macao. So ignorant of the use of the weapon are the Chinese of the time said to have been, that, we are told, gunners had to be sent with the guns to teach them how to work them.

The story of the first casting of guns in China is curious. Two missionaries, Ricci and, after him, Adam Schall, had attained great influence at court as mathematicians and men of science. The latter, between 1630 and 1640, A.D., was appointed head of the Astronomical Board, under whose direction was carried on the important duty of regulating the calendar, and his scientific qualifications probably seemed unbounded to the Emperor and his courtiers. The three guns from Macao had done good service against the Tartars; and during an invasion of the country by them, it was suggested that the fortified towns should be armed with similar weapons. Schall was asked, as though casually, if he knew anything of the art of cannon-founding; and, replying that he was not wholly ignorant of the process, was directed by Imperial order to begin at once and establish a foundry. In spite of his protests of insufficient ability, he was compelled to assume the superintendence of the workmen, and he succeeded in casting a large number in the year 1636. Father Verbeist performed the same office for the Manchu usurpers, and added several hundred pieces to those cast by his predecessor. Strange as it may seem, this apparently well-authenticated story does not altogether dispose of the Chinese claim to have invented cannon themselves. Lieutenant Forbes, R.N., writing in 1848, tells us that he saw at Woosung,

shortly after our forces had destroyed the batteries there, guns lying about on which was the date answering to 1632, that is, four years earlier than Schall's establishment of the foundry. Captain Arthur Cunynghame, aide-de-camp to Lord Saltoun in our first war with China, relates, in a book published in 1844, that he had seen captured guns which were composed of plates of iron bound together by hoops of the same material, and in one case by ropes of silk; which latter may recall to some here present the ancient gun in the armoury of the Palace at Malta—a metal tube bound round with rope.<sup>1</sup> This system of construction had become obsolete for generations before the missionaries began to cast guns for the Emperors; and it is quite inconceivable that, having adopted the more improved plan, a return should have been made to the older and long disused method. The true explanation of this apparent contradiction is probably to be looked for in the provincial organization of the empire before alluded to. Some local army may have been provided with cannon by its chiefs quite without the knowledge of the Central Government. For us, engaged in our present examination, the true significance of the story of Schall's and Verbeist's labours, and of the introduction of matchlocks is, that we learn from it that, even as far back as the sixteenth and seventeenth centuries, the Chinese, however averse to the introduction of foreign inventions, showed no repugnance to learn from strangers in the art of war. Their history since proves the same to be the case, without exception.

Mention has already been made of the comparative superiority of China in the arts, when compared with Europe, at the date of our first extended intercourse with her. Till very recently, if not quite till now, while Europe has been making enormous advances, she has remained stationary. Three centuries ago, perhaps even long before, she attained the summit of her culture. Further west, the most remarkable progress in the art of war has been made within our own time; but there was movement forward throughout the whole period. The fairly good discipline of the Chinese troops at the early date spoken of, deteriorated, or at all events did not progress, within the period that has since elapsed. A tactical system, exact in the manœuvres composing it, and not unsuited for use against the only enemies which threatened the borders of the Empire, as far as we can see, also, but little more pedantic and little less effective than that which Europe learnt from the great Gustavus, was noted by our missionary authorities as being in force in the Chinese Army quite as soon as the "Swedish battaile" was recognised as an excellent formation for European soldiers. In these two particulars, therefore, the West could teach China little, but of what it could, she was a not too repellent learner; so that her not having taken lessons from us in such matters till within the last few years, is not by any means evidence that her traditional conservatism was proof against our instruction.

During our first war with the Chinese, in 1841-2, their Army and Navy was much in the condition in which it was described to us as

<sup>1</sup> There is a "silk gun" in the Museum of the Institution.—ED.



being nearly two centuries before. The Navy, like the Army, under the supreme direction of the Board of War, was even more distinctly provincial in its character than the land service. There was nothing answering to the Banner force in the considerable flotilla which guarded the coast, and did police duty on the internal waters of the Empire. The number of seamen belonging to it is generally put at about 30,000. The Officers occupied similar positions and bore the same titular designations in the different ranks as did those of the Army. The combatant Officers were rarely or never sailors. The navigation of each vessel was left to a sailing master and his assistants, as was long the case in more important navies elsewhere. The latest English writer on China, Archdeacon Gray, gives an account of the Navy of China which presents us, probably, with an exact picture of what it was for ages, and what great part of it still continues to be. The art of shipbuilding had a long antiquity in China. The ocean-going war-junks were often of great size, and, being exceedingly handy, not bad sailers, and divided into water-tight compartments, were probably not at all inferior to the barques which carried Vasco de Gama or Magellan on their adventurous voyages. But whilst Europe had been advancing to the "Alexandra," or at least to the "Duke of Wellington," the Chinese shipbuilder's craft had remained stationary. The ships had high bulwarks and pentagonal port-holes. Guns were mounted solely on the upper deck, frequently on immovable carriages, and the crews had but the slenderest knowledge of gunnery. "The ocean-going war-junks do not," says the Archdeacon, "form the bulk of the Imperial Navy." There are large numbers of light-draught gunboats for lake and river service. Many of these are similar to the galleys of the sixteenth and seventeenth centuries in the Mediterranean, and can be propelled by oars at a great speed. As a specimen of a provincial naval force our author gives us a description of that of the province of Kwang-tung. There are 161 vessels always in commission. These are divided into three classes, viz., the first of 10 junks, the second of 115, and the third of 36. The cost of each of the first division is about 1,300*l.*, of each of the second about 1,100*l.*, and of each of the third about 800*l.* They are classed for nine years only, and are not allowed to go into dock until they have been three years in commission. At the end of that time the provincial authorities are empowered by the Board at Peking to expend a certain fixed sum, according to the class to which she belongs, on each vessel for repairs. After a second three years' commission, they are again docked for repairs, the amount of money allowed for the purpose being definitely fixed, as in the previous case. After a third commission they are considered as no longer fit for the service. Before any vessel can go into dock for repairs the mandarin under whose orders she is placed applies by letter to the Governor-General or Governor of the province for authority to lay her up, certifying that she has completed her three years' commission, and is in need of repair. The Governor-General, or Governor, in reply gives the permission asked for, and the expense is defrayed by the Salt Commissioner. An annual allowance is made to each vessel for wear and tear of sails, ropes, &c. The Chinese

evinced no small aptitude as seamen, and I have more than once seen a squadron of war-junks, sailing in company, manœuvred in a very creditable manner, whilst the appearance of each particular vessel left little to be desired.

The art of fortification amongst the Chinese until we made war on them in 1841 was much behind that of Europe, though perhaps quite equal to anything they had to apprehend from any neighbouring enemy. They were credited by our Officers even then with the merit of being able to select good positions for their works. Long lines of parapets, thinly built of masonry, or even mud, and cut by innumerable embrasures, through which were generally pointed guns, usually of very small calibre, constituted their chief defences. These of course offered but a poor resistance when brought under the fire of the 32-pounders of our ships. The fortifications of inland towns were still more primitive. As a rule near the coast, suburbs have so grown up round the large towns and cities, that the walls are not easily distinguishable. But on my way to the Great Wall at Nankow the autumn before last I had to pass several towns, where, if there was any suburb at all, it was a mere cluster of houses outside a principal gate. In all the same trace was pretty accurately observed. A rectangular rampart crowned by a thin wall of masonry enclosed the place. Towers, as in mediæval Europe, stood at the angles and at intervals on each face. The gates were surmounted by a blockhouse, pierced with innumerable ports and loopholes; and an interior retrenchment formed a sort of lunette at the entrance. Outworks and advanced works were never seen, except occasionally small detached square towers on eminences and at the mouths of passes through mountains. In our earlier attacks on the Bogue forts there were not wanting evidences that even in fortification the Chinese had consented to learn something from strangers. As a matter of fact, the opportunities which the former possessed of observing foreign systems of defensive works erected in their neighbourhood by Portuguese, Dutch, or Spaniards were not such as to give them much cause to disparage their own. The tiny bastions of masonry and *guérîte* surmounted salients of the pre-Vauban period, which are in their ruins so familiar to visitors to the transmarine possessions of the maritime powers of the sixteenth century, were superior indeed to the continuous lines and square towers of a Chinese fortress, but not so obviously so as to make their supersession of the latter at once seem necessary.

When we fought with China in 1840-2 little real progress seems to have been made since the seventeenth century. The batteries we found opposed to us were armed with guns of small calibre, the parapets had little resisting power, and the matchlock, loaded with loose charges of powder, was still the chief portable firearm. Our own weapons, it is true, were—though much more efficient—not very formidable. Smooth-bore guns composed our entire ship and field artillery. Our infantry still carried the “Brown Bess” musket, and the flint lock was hardly completely superseded by the percussion cap. The tactics of our own forces were still far inferior to what we have since made them, but our enemy’s were much behind them. Lieutenant Forbes mentions that in

some cases every Chinese soldier carried a lantern, and thus afforded an excellent mark at night. The matchlock frequently led to horrible destruction of wounded men, as their cotton clothes were in many instances ignited by the lighted match. Sometimes the Chinese Officers showed a certain ingenuity in the use and arrangement of explosives. An old French writer two centuries before had noted that "their valour consists in policy and stratagems of war;" and a still earlier Portuguese navigator had, whilst acknowledging their passive courage, observed that "they always use strange policies and all kinds of fireworks, both by sea and land." A statement, the truth of which we have had some opportunity of testing in junk actions and on the rivers.

Our first war, however, taught them some lessons, which they aptly learnt. Captain Cunynghame wrote at the date above mentioned that they had "already launched a fine frigate built by an American." Lieutenant Forbes recorded his opinion that "a few years of active hostilities would teach them the art of war, and enable them on land to defy invasion by any Power in Europe." And even at the time at which he was writing the Chinese had "two or three English-shaped ships." In a periodical called the *Friend of China* it was stated five-and-thirty years ago that "the Chinese are building ships on European models for defensive objects; that they are constructing their forts on better principles; and that they have foreigners in their pay, from whose instruction they hope to benefit in the practice of gunnery." Internal disorders, especially the great Tai-ping rebellion, prevented much progress being made in the path on which they had entered, but our experience in front of the Taku forts in 1859 proved that their knowledge of both gunnery and fortification was different to what it had been sixteen or seventeen years before.

It was really after the close of our last war with them that the great advance began to be made. Assistance was rendered by both France and England to China in the training of troops, who should be employed in putting down the still unsuppressed insurrection of the Tai-pings. The aptitude of the soldiers then trained was amply demonstrated by the force led by our countryman Colonel Gordon, which deserved and obtained the appellation of "the ever-victorious army." When this work had been accomplished, that of establishing arsenals and dockyards on the western system began. From an interesting paper in the *Cornhill Magazine* for December, 1872, I draw the following particulars:

In 1861 Dr. Macartney, who had been serving as a medical Officer in Her Majesty's 99th Regiment, offered his services to Li Hung Chang, at that time Governor of the province in which the city of Shanghai is situated, as instructor in the chemical processes required in the manufacture of explosives for military purposes. They were accepted; and a small manufactory of rockets was begun, and a small number of mortars were cast. When the rebels were driven out of Nanking in 1864 by the Imperial forces the works were removed to it, and Dr. Macartney was placed at the head of what is now the oldest Chinese arsenal on the new plan, and an important factory of heavy



guns. Several others have since arisen, viz., at Foochow, Shanghai, and Tientsin. The two former are rather naval yards than arsenals, though the ordinary work of a great factory of arms is carried on at both.

The history of the Foochow establishment is very remarkable. In a former number of the *Journal of this Institution* (vol. xx, No. 88) will be found an account of it and of the work done at it, which I translated from a pamphlet by its founder and chief, Lieutenant Giquel of the French Navy, whom I had the pleasure of meeting whilst serving in China. Time would fail were I to attempt to recount it now in detail; and it need only be stated that in the course of seven years from the date at which the preparation of a site was begun, not only was a great naval yard, forty acres in extent, with dry docks, building slips, steam factory, workshops for making delicate and scientific instruments, and a school and training ship for young Officers formed, but a large number of very efficient ships-of-war were built, equipped, and put to sea. I doubt if such an amount of work has ever been executed under such difficulties in so short a time in any country in the world.

In 1865, after Dr. Macartney's departure, a small establishment for the fabrication of rifled small arms and shells was set on foot at Shanghai under an American superintendent. Two years later a more extensive one was erected at a short distance from the native city. In 1876 I visited it in company with Captain Colomb. There were dry docks, slips, cannon foundries, cartridge-making factories, and a large shop for the production of Remington breech-loaders, which could be turned out at the rate of 500 a week, and there was also a large number of breech-loading guns and Gatlings, and a quantity of torpedo stores. An enormous plant of machinery had recently been received from England, and was in course of erection. Two steam frigates, one of which was in commission, and which I was allowed to inspect, had already been built and engined there: and a small ironclad gunboat for river service was being fitted at one of the jetties. It was in contemplation to establish a series of workshops for the manufacture of armour plates. A chemical laboratory for the fabrication of fuzes and electric firing apparatus was already in existence. The frigate was a handsome craft armed with Krupp breech-loaders, and from Captain to boy every soul belonging to her was a native Chinese. She is said to have great speed. No fault could be found with her neatness or cleanliness.

At Tientsin I visited a cartridge factory, appropriately established on the site of the temple in which Lord Elgin signed the treaty of peace. There is also a powder factory at the same place, but some distance from the cartridge establishment. At Canton negotiations were in progress for the purchase of the Whampoa dry docks, some dozen miles below the city, from their proprietors, an English company, for the purpose of converting them into a naval dockyard; but I have not heard with what result.<sup>1</sup> The ships built and equipped in the

<sup>1</sup> Within the last few days an apparently well-founded report, that an arsenal and dépôt for military stores is to be at once established at Peking, has reached London. (June 13th, 1878.)

country, together with those purchased abroad, now amount to a respectable total; and most, if not all of them, are of the most modern construction, have arms with the latest improvements on board, and are respectable performers under steam. Two gunboats of the "Staunch" class on Mr. Rendel's plan had arrived in China before I left; and a year ago I passed two others in the Red Sea on their way out, and it has been known for some time that they had reached their destination.

At Canton, Foochow, Shanghai, Chefoo, and Tientsin, and I believe at several other places, there are bodies of troops armed and drilled as those of the West. At some garrisons the words of command are given in English. I have no more than a rough estimate of their numbers, but I suspect they do not fall short of 20,000 men.<sup>1</sup> The suppression of the Yunnan insurrection some four years ago was, in a measure, owing to the superior armament of the Imperial soldiers, to whom European weapons had been taken by foreign speculators. The Chinese Generals, however, have not been content with availing themselves solely of the advantages due to the adoption of Western arms and tactical systems; they have recently imitated the most memorable strategic feats of European commanders. In the *Spectator* newspaper of April 13th there is an interesting account of the Chinese re-conquest of Eastern Turkestan, from which I will read some extracts.

"The campaign which commenced with the sieges of Urumtsi and Manas in the autumn of 1876, and which was brought to a close with the fall of Kashgar in December last, is beyond doubt the most remarkable military enterprise which has been attempted by any Asiatic nation within the present century. If we simply consider the enormous distances over which large bodies of men have been transported, the feat must be admitted to have been no ordinary one; but when we have added thereto such difficulties as those caused by the barrenness of the region in which the war was to be carried on, the reputed strength of Kashgar, the hostility of the Mahomedan population, and the scarcely concealed distrust of Russia, we find that the task which a Chinese General and a Chinese Army have accomplished is one that deserves to rank with many of the most celebrated of European campaigns.

"In the year 1875, the Chinese Government resolved to chastise the rebel Powers which had broken away from its control in the country lying beyond the province of Kansuh. The chief of these were the Tungan rulers of Urumtsi and Manas, and Yakoob Beg, the Ameer of Kashgar. At Lanchefu, the capital of Kansuh, troops were accordingly collected in large numbers, and the necessary stores and supplies of cannon and ammunition were forwarded with as little delay as possible to the same place. Before the close of the year 1876, the first of the rebel Powers had been overthrown, and Chinese influence and prestige restored in what, for want of a better term, may be called the region of Ultra-Kansuh. It now only remained for the Chinese Army to deal with the second and more formidable Power. In the short space of twenty-one days the Chinese had marched close on 400 miles, captured three cities, and won one pitched encounter.

"The joint armies of Tso Tsung and Kin Tang pressed on against Kashgar itself, and after winning a battle underneath its walls, in which Kuli Beg was wounded, the capital of the dominions of the late Athalik Ghazi once more was entered by a conquering army from far-distant China.

"Such, briefly narrated, is the story of the Chinese re-conquest of Eastern

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<sup>1</sup> An English friend connected officially with China puts the number at, at least, 25,000. There is every reason to believe it is increasing.

"Turkestan, and we think that no one will dispute the fact that, both in strategy among their Generals and in endurance and courage among their men, this Chinese Army has done much to revindicate the old and long-lost prestige which attached to the soldiers of Kanghi and Keen Lung."<sup>1</sup>

From this account we may see that the Chinese troops are not only well equipped and well trained, as compared with what they were during our last war with the Empire, but that they are also well commanded.

The defence of their coast cities has not been neglected by the Chinese. At Canton, Woosung, and at the mouth of the Peiho, immense forts were being erected at the time of my visits to those places, and are most likely now completed. In some cases they are provided with iron plating, and in all heavy European guns are mounted. I myself saw, more than a year ago, a couple of 14-ton Krupps being disembarked from an English steamer for conveyance to the forts on the Canton river. I must leave you to draw your own conclusions as to the effect which this remarkable advance in the improvement of their defensive system is likely to exercise on the relations existing between China and the countries of the West. That they are resolved to do all they can to render their country strong, I think the step recently taken of sending young men to serve in the forces of foreign Powers is a striking proof, and it would not be easy to say what nation there is that has any right to regret such resolution.

If, as regards China, the determination to be guided by foreign instruction in naval and military affairs is but an exception to an otherwise unvarying repugnance to depart from ancient custom, in Japan it is merely a portion of a general scheme of imitation of foreign institutions. When first we became acquainted with the latter country it was under a curious system of government. The nominal Sove-

<sup>1</sup> The lecturer here read some observations of a writer in the *Pall Mall Gazette* on the above operations and the important military position lately assumed in China.

" . . . Henceforth China is more than ever a power to be reckoned with in considering the affairs of Central Asia."

"Yet the change may prove of considerable moment in many ways, and the manner in which it has been brought about gives a vivid impression of the vigour which may some day be displayed by the Chinese in asserting what they conceive to be their rights, however long they may allow their claims to lie dormant."

"By the end of last year the whole of the territory which Tso had set out to recover for his Imperial master had been completely overrun. . . . What more, we may ask, could have been done, we do not say by Russia, but by an European country? . . . Surely when we talk of the disintegration of China, the hopelessness of improvement, the incapacity of the race for great military undertakings, such an instance as this following so close upon a similar expedition [that against Yunnan] in another direction should make us pause. . . . Many observers, from the Abbé Hue onwards, have pointed out how formidable a Chinese Army well drilled, well armed, and above all well led, would prove should such a force ever take the field. The men are hardy, industrious, educated, indifferent to life; and though they themselves are averse to war, their Tartar rulers are not.

"He would be a bold man who would venture to predict the future of China, but one thing seems certain, that, in spite of famines and misgovernment, her people will play a much more important part in the history of the Eastern world in time to come than they have of late years; and for this it behoves us, as the country most nearly concerned, to be prepared."



reign, the Mikado, was overshadowed, and shorn of all real power by a powerful official, to whom foreigners have given the name of Tycoon or Shogoon. The Shogoon practically was but a leader amongst a number of powerful peers—*primus inter pares*. The latter, with a host of minor barons, were in much the same position as the feudal lords of Western Europe in the middle ages. Each exercised sovereign power in his own dominions, and was obeyed by an army of retainers maintained out of the revenues of his territory. A military class existed, the members of which alone were entitled to bear arms. Known by the designation of *Samurai*, they claimed to be considered gentlemen, and are always represented as such by our earlier authorities. A feudal force in Japan resembled a feudal array in Europe. A Dutch minister of religion, who was in Formosa in the sixteenth century, in giving an account of Japan, says, "the gentlemen who served on horseback were obliged to keep five, ten, or twenty servants, according to their different qualities and estates; these servants are obliged to fight upon occasions as well as their masters." The qualifications required of a gentleman who served in the Army were, to be "very nimble and active, very well instructed in the exercise of arms, not ignorant in books; and above all he must have the reputation of being a man of honour." A yearly revenue of 10,000 florins carried with it a liability to bring into the field a following of two horsemen and twenty foot soldiers. We see here the whole system of knights' fees, men-at-arms, esquires, and yeomen, as it was understood in feudal Europe. According to Captain John Saris, who visited the country in 1612, there were garrisons maintained by the Shogoon in several of the principal cities. These apparently formed a regular standing army. The cavalry, the same authority tells us, wore complete armour, and carried very short carbines (matchlocks, which they had learned the use of from foreigners), javelins, darts, and sabres. The infantry wore helmets, and were armed with two swords, a kind of pike, and occasionally firearms. The discipline was good, and the system of tactics elaborate. According to Kaempfer, the whole array of the feudal baronage amounted to some 300,000 foot and 38,000 horse. The Shogoon had of his own 100,000 foot and 20,000 horse. The practice of wearing armour, and of depending upon the sword and the bow as offensive weapons rather than on firearms, lasted till very recently. In the civil war of 1868, the great Princes of the Empire took the field encased in mail, and muskets were but little used by their vassals.

The limited intercourse with foreigners which for nearly three centuries the Shogoon's Government permitted the Japanese to maintain, still led to the introduction of some modifications of their military system. Certain of the more independent feudal chiefs adopted contrivances for the improvement of their armaments which had been in use in Western countries. Firearms were improved, cannon were mounted in forts, and the defensive works which protected the chief sea-ports of the Empire were in many cases unquestionably designed in pursuance of the instructions of Western engineers. Some of the detached forts which stud the bays of Yedo and of Ozaka

are of polygonal trace, and at the epoch of their construction were in advance of many of the coast batteries of more progressive countries. When the Shogoonate entered into negotiations with Western Powers steps were taken to place the naval and military forces of the *Bakufu*—as that Government was called—on a more improved footing. Arms were purchased from foreigners, and ships were built after Western models. Foreign instructors were engaged to train Officers and men for the land and sea forces. French Officers for the former, and our own countrymen for the latter. Dr. Rennie says, under the date of 1861, “The Tycoon’s Government is certainly now beginning to train “troops according to a modification of the European system;” and he visited barracks of disciplined Japanese in 1862. When Lord Elgin went to Yedo in 1858, there was a squadron of two square-rigged ships, and a couple of steamers lying in the bay. Mr. Laurence Oliphant went on board one of the former. His account of her enables us to form some idea of the progress that has since been made. In shape, she was “like those cumbrous arks in which our ancestors used “to circumnavigate the globe.” She was painted a bright red; her masts were of ponderous size; and her rigging was bleached white from the action of the weather and the absence of *blacking*. A few 32-prs. were lying about the decks; but there were no carriages nor side-tackle bolts to be seen. When our forces attacked Kagosima and Simonoseki we found the Daimio’s troops who held the works at both places not at all ill armed and fairly well commanded; but European tactics had been hardly adopted at all. The disturbances in the country which ended in the restoration of the Mikadoate in 1869 led, as we know, to a wholesale introduction of Western customs. An Imperial Army and Navy were formed, and replaced the feudal array of the now disestablished barons. A new naval college was set on foot at the capital, and, under a succession of Officers of the British service, has turned out a body of naval Officers but little inferior in their acquirements to those of Western navies. Dockyards were established at Yokosuka, near Yokohama, and at Nagasaki, and ships were purchased in Europe, or laid down on the new building slips. Seamen were regularly trained, and a corps of marines, on the plan of our own distinguished force, organized under an Officer of that service. The Army was trained by Frenchmen, and its ranks were still filled only with *Samurai*, the military class, whose members resembled but too often the “ruffling cavaliers” of the Elizabethan period. Young men belonging to both Army and Navy were sent into the services of foreign Governments to learn their duty. At the present moment Japan possesses something more than a respectable fleet. She has four ironclads—two but recently constructed in this country—some fifteen other vessels of the cruising classes, and five training ships. All the above are steamers. In addition to the naval yard at Yokosuka, in which the large ironclad to which I belonged when on the station was docked, there is a splendid dry dock, capable of taking in the heaviest ships, nearly completed at Nagasaki, and an important steam factory at the same place. Japanese men-of-war have made long voyages, and one, I believe, may be expected shortly in this

country. It need hardly be said that arms of the most improved pattern are mounted on board the Mikado's ships.

The Government has recently done, as many Western administrations have done, and has copied the Prussian system of army organization. In December, 1872, an Imperial decree made known the plan and details of the new system. The preamble, perhaps with unconscious irony, declared that this considerable augmentation of warlike power, and the extension of liability to serve to the whole population, is "in accordance with the spirit of 'the age!'" Thus is the spirit of Western civilization interpreted in the far East! The *Samurai* are no longer exclusively liable to service. All Japanese are now subject to conscription at the age of twenty, and may be enrolled in either the Army or the Navy. The former is divided into standing army, reserve, and militia. Service in the standing army lasts three years. The 1st Reserve is composed of those who have completed three years' service. They are called together twice a-year to live in camp and be drilled. After two years in the 1st Reserve, they pass into the 2nd Reserve, and are then liable to be called out only when the levy *en masse* is made. All males between the ages of seventeen and forty, not included in either of the above classes, belong to the militia. The minimum standard of height is 5 feet 1 inch.

The Empire is divided into six military divisions; and there are thirty-seven camps and garrisons. The following is a detailed statement of the strength of the Army on a peace and on a war footing, all the troops belonging to which are armed and equipped as in the foremost European countries.

Troops.	Peace.	War.
Infantry { 14 brigades { 42 regiments } .....	26,880	40,320
Cavalry, 3 regiments .....	360	450
Artillery, 18 companies .....	2,160	2,700
Engineers, 10 companies .....	1,200	1,500
Military Train, &c., 6 companies .....	360	480
Marines, 9 companies .....	720	900
Totals.....	31,680	46,350

Besides the above the Imperial Guard consists of the following picked troops:

Infantry, 2 brigades (4 regiments) .. .. .	3,200
Cavalry, 1 regiment .. .. .	150
Artillery, 2 companies .. .. .	300
Engineers, 1 company .. .. .	150
Military train .. .. .	80

Total .. 3,880

The total strength of the standing army, on a peace footing, is 35,660, and on a war footing, 50,320 men. We read in a recent work



on Japan, that "the details of the military law have been well carried out, and the scheme realized." It is in contemplation to introduce German instructors in place of those of French nationality. On an emergency it is believed that Japan could put into the field 75,000 disciplined troops.

This brings us to an end of such examination of the naval and military progress of China and Japan as I have felt capable of making. I feel how incomplete and imperfect it is, but I hope I have been able to call attention during it to the great advance those two countries have made.

Captain COLOMB, R.N.: Naval people in passing from China to Japan and back again naturally make comparisons between the two countries, especially with reference to their capacity and progress in the art of war. Now I think you can see from the lecture we have just heard that my friend, the lecturer, dwells upon the capacity and progress of China for war with more lingering lovingness than he does on that of Japan. I myself am inclined to think that Japan, upon the whole, has greater capacities of that kind. But there is this great difference between China and Japan which struck me every hour that I passed in Chinese waters, and which I think cannot fail to strike anybody who examines the characters of the two people, as seen in their own country. It is this, that Japan is a revolutionised country, and China is not, and I cannot help thinking that if the tremendous political convulsion which a revolution in China means, were to take place, we should see a progress in that country in the art of war as in other arts, of which we cannot at the present time form any comprehension whatever. Then on the other hand, looking at the characters of the people, you see two great differences throughout. Amongst the Japanese there is that which we have been accustomed to call "chivalry," although Japanese chivalry is not exactly parallel with what we understand by the term in England. Now in China that character of chivalry is totally absent. I have never heard of any instance in China of that sort of self-sacrifice which we understand by the word "chivalry." Now it seems to me that for capacity for war you must have at the bottom that capacity for self-sacrifice which is meant by chivalry. On the other hand there is this to be said, that you may have the most magnificent soldiers—speaking of private combatants—without one single grain of chivalry, provided they are properly led. I take it that the Chinese have that, that is to say, that there is immense capacity for war amongst them if there are the leaders, but in spite of all that the lecturer has said about the astonishing progress of the Chinese in Kashgaria I am not yet converted. I think China will never become a great military nation unless she sticks to European leaders. In Japan I think it is different; I think the Japanese have the power of leading men; I think that they have the capacity of becoming not only private soldiers but Officers in command and Generals. Now there is another quality which must be found in a nation which aspires to progress in the modern art of war, and that is accuracy. You cannot at the present time carry out war without an attention to accuracy of details which was not required in olden times. You require accuracy of organization, you require especially accuracy of manufacture in your weapons, and I think that when you speak of the progress in the art of war of Japan and China, you must speak also of their progress in the art of manufacturing the weapons of war. The two countries are totally different in that respect. In China no manufacture once trusted to the hands of the Chinese themselves, remains as it was at first: it invariably becomes worse and worse. We have always been accustomed to hear of the power of the Chinese for imitating: they do imitate things from a pattern uncommonly well; give them something to make from a pattern, the first object that they turn out will be exceedingly like the original; but take away the original, and the second copy will be worse than the first; take away the first, and the third will be worse than the second; and so on, the manufactured article after it has passed through all these stages becomes absolutely and entirely different from the original pattern. In Japan, on the contrary, after any number of passages through these

patterns, the last object will be quite as accurate and complete as the first was. There is an instance of it which is, I think, conclusive. In the Imperial Mint, at Osaka, in Japan, which is chiefly in the hands of Japanese workmen, there are a few European superintendents, but the work itself is done by Japanese workmen. Now I saw the worn out steel dies which had been supplied from England some years before, and I compared them with a very powerful magnifying glass with those that were made by the Japanese themselves. It was quite impossible to detect any difference, and the coinage of Japan, which is entirely in the hands of Japanese so far, is quite as fine and good at this moment as any coinage in England. Now take on the other side the accuracy of the Chinese workmen. In the arsenal at Shanghai, which Captain Bridge and I visited together, and where, as he mentioned, there is a large manufactory of Remington rifles, I went to one of the benches where the most important part of the rifle was being made—the sight—and I found that even there in that manufacture, the lengths of the sights differed by as much as half an inch. It has always seemed to me that there is that flaw in the Chinese character, that they never quite comprehend the whole question before them; they copy a thing but they do not connect it in copying it with any other part of the matter with which they have to do. Captain Bridge has spoken of the incongruity that we witnessed between the rifle practice according to the Hythe rules, and the double sword practice, the most comical, I think, except the spear practice, of any drill I have ever seen. I am quite certain that every drill in China, once it is left to the Chinese themselves, deteriorates and becomes ultimately a sort of ballet. We landed at a port in the North of China one day where some troops were being drilled by English word of command. The troops were armed with excellent rifles and field pieces, but there was this incongruity that there was a flag to every third man. You see the same thing when you come to examine other Chinese works. Take for instance the casting of guns. One day I went over the arsenal at Hankow with Dr. Macartney, and he showed me a cast 64-pounder which has been turned down to represent in outward form an ordinary Armstrong gun. The history of it was this, that he had gone away from the arsenal and the Chinese superintendents were left full control for the time. They had got hold of some drawings of the rifled guns, and they had actually turned down this large cast-iron gun under the impression that if they made the outer shape of it to correspond with the drawings they had made that gun an efficient rifled gun. But still there is no question but that the progress of China in the art of war, although slow, is on the advance, yet my difficulty is this, whether China, left to herself, will fall back into her ancient arts of war, or whether she will make any advance. So the same question remains in Japan. Japan, as I say, is a revolutionised country, and the effect of revolution of course is to stir minds to an extent to which nothing else will stir them; it consequently appears to the casual observer that the progress of the art of war in Japan is more rapid and solid than that of China, but on the other hand if I take away the element of revolution from the two countries I remain in doubt whether my conviction is a right or a wrong one.

Admiral Sir ERASMUS OMMANNEY: I should like to ask Captain Bridge, as China is likely to become a naval Power, whether he has thought of the great resources which China holds in her coalfields, because I think when she comes to work these coalfields she possesses the greatest power of equipping a steam navy of perhaps any country in the world. I do not know whether his attention has been called to that circumstance. If there is any development of coalfields in China no doubt she will have the means of keeping very formidable steam fleets.

Lieutenant-General Sir H. NORMAN: I may mention one little point which will show the great progress made by the Japanese of late years in one rather important branch connected with the Army and Navy, that is, the hospital. I happened to be at Nagasaki last year when the rebellion was going on in the Southern Province, and a steamer loaded with wounded soldiers was brought into the harbour. I asked permission to go over the field hospital; there was some little difficulty at first, but eventually I was allowed to go. I was accompanied by a medical Officer, who had had a good deal of experience in war, and knew a great deal about the treatment of wounds. We were conducted round the hospital, which was extemporised by two medical Japanese Officers in uniform. I never saw field hospitals in war better con-

ducted; everything was clean; there were no smells; the men were well attended to, and had every possible comfort. Several of the men who were badly wounded had their bandages undone to show the medical Officer who was with me, and, according to his views, the treatment could not have been better if it had been carried out by our own medical Officers. I certainly went on board our steamer again with a profound conviction of the great progress that had been made by this nation in the last twenty years; a conviction certainly not weakened by what I saw afterwards when I visited the naval dockyard and other Government institutions in the neighbourhood of Yokohama.

Colonel CLINTON: I think the subjects of this lecture are very interesting, but they hardly can be said to compare one with the other. I made some time ago a comparison between the different nations of the world, and found that there are but two or three nations worth considering as far as population goes. The enormous population of China stands first in the world as a power, supposing you have the will and skill, the time and the credit for carrying out any views you may choose to carry out. In the same way with the English Empire, if you have the same qualifications, you can establish an army of 20,000,000, if you please, you have the power of doing so. The Chinese could put 40,000,000 into the field, and the English Empire 20,000,000; therefore I think it is hardly worth while speaking about the progress of Japan when you think of what other nations can do.

Captain BRIDGE: I should like to occupy one or two minutes in trying to vindicate the Chinese, for whom I have the most friendly feelings, from a charge (if I may so call it), that Captain Colomb has, I think, brought against them of want of chivalrous feeling. (The CHAIRMAN: I do not remember that he did that.) An absence of chivalrous feeling then. I think the history of the conduct of the Governors and Officers commanding some of the fortresses in Eastern Turkestan, when that district was taken from the Chinese Empire, that district which has recently been re-conquered, is almost unsurpassed in any history. We know that in the Navy it used to be thought that a Captain should always go down with his ship—it was looked upon as the proper thing to do—the ship should be sunk rather than the flag struck. Things of that kind were frequently and repeatedly put into practice by the Governors of fortresses in Eastern Turkestan, for they would not surrender. It may have been unwise from a strategical point of view, although that is doubtful, as they probably would have been massacred as soon as they did surrender, but when they found that there was no hope of retaining the place attacked by the insurgents, they simply fought to the last, and either blew themselves up and as many of their enemies as they could, or allowed themselves to be killed in the breach. The particular point to which Captain Colomb has called attention, viz., the deterioration in a manufacture when it gets into the hands of the Chinese, undoubtedly exists, and what he has said quite coincides with my own experience. He called my attention, I particularly remember, to the fact of the difference in the length of the sights that were being made in the Kiang-nan Arsenal, near Shanghai. It certainly was the case that there were scarcely two sights of the same length; but I am not quite sure that we should not find something of the same sort in a factory in Europe, where we had not got a very large number of highly qualified leading men. Now, the Chinese in undertaking this manufacture so new to them, the manufacture of arms of precision, were somewhat in the condition of unskilled labourers without any very skilled supervision or superintendence. With regard to the story of the 64-pounder gun, which was turned down from an ordinary smooth-bore until it resembled in appearance an Armstrong rifled gun, I think I can parallel that by a story told me by an English Officer holding a very high appointment in the Naval Establishment at Yedo. A new mainyard was required for a training ship attached to the naval establishments at the capital. A mainyard is not simply a piece of wood, but is composed of several pieces of wood, and the outside, so far from being smooth, is full of all sorts of elevations and depressions and ribs and bands. An order was sent to the dockyard in the usual way to make a new spar of the nature required for this training ship, and some drawings were sent of the plan on which it was to be made. A mainyard came back from the shop which exactly came up to the drawings, but it was not made of several pieces, it was *carved out of the solid*. It was simply a



piece of wood of sufficient size carved out by some of those skilful Japanese carvers, whose skill in ivory work and wood carvings of various sorts we know well in this country. One thing that at this moment tends to give Japan, in my opinion, a superiority in military and naval organization, and also military and naval power over China, is that they have not yet lost the old feudal traditions. Japan had, to her good fortune, for a long time, a feudal system and an aristocratic class, and those things provided her, to a great extent, with natural leaders for her naval and military forces; but the feudal system has been altogether abolished, the aristocratic class has been put under disabilities and it in time will disappear. Whether, when the new generation, which is being taught to look upon the feudal system as something obsolete and unsuited for the country, and which loses all the aristocratic traditions, whether, when that generation comes to the head of affairs, we shall find the Japanese Army and Navy as well officered as it is at present, is a matter of which I have very considerable doubts; and I am inclined to think that as in China there is practically no aristocratic class, the two countries will be placed more on a level in that respect.

I had not alluded to the very important question which Sir Erasmus Ommaney mentioned, the existence of coal in China, although I am not unaware of the great wealth of the country in that particular. In fact, I visited some coal mines in Formosa, which are about to be worked with English machinery, and there can be no question that it will add greatly to the efficiency of her steam Navy—this facility which she has of providing them with proper fuel.

Sir Henry Norman was good enough to give us some information about the military hospitals in Japan. I think one of the things most to the credit of the Japanese, is the persistent way in which they have endeavoured to establish a native medical school. Every person who has visited that country has been struck with this. All over the country they have established hospitals; there are Government Medical Officers in most considerable places, and attempts have been made to teach rudimentary knowledge of hygiene and physiology in the public schools of the country. I was particularly struck in visiting the exhibition held in the Mikado's Old Palace at Kiyoto, some couple of years ago, by the number of anatomical plates shown, some of them, I believe, drawn and printed in the country, and although I was not able to pass an opinion upon their correctness, yet there is no doubt their execution was admirable.

Colonel Clinton spoke of the smallness of the population of Japan not giving it any weight in the affairs of the world. Now the population of Japan is small by comparison with the great population of China, but it is about double the population of the Kingdom of Prussia when the Kingdom of Prussia undertook the great campaign of 1866, and as there is at present a still existing military class, numbering some millions, I think it would be unsafe to rely upon the want of pugnacity or absence of aggressiveness of the Japanese people on account of the smallness of their population. They certainly exhibited considerable pugnacity and a strongly aggressive spirit in their dealings with China with regard to Formosa, and in their dealings with the Corea, and they are at present enjoying the advantages of having forced another country to make a treaty with them, or to modify a treaty on the implied threat of war, without the trouble or expense of going to war for it, an advantage of which we, perhaps, have had some experience of late.

The CHAIRMAN: I think I may ask gentlemen present to give their best thanks to Captain Bridge for the lecture he has given us.

# LECTURE.

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Friday, November 29th, 1878.

GENERAL SIR J. LINTORN SIMMONS, R.E., G.C.B., Inspector-General of Fortifications, in the Chair.

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## MILITARY MAP MAKING.

By CAPTAIN HOLDICH, R.E., F.R.G.S.

SIR LINTORN SIMMONS said he had much pleasure in introducing the lecturer, Captain Holdich, Royal Engineers, who had had a large and varied experience on the Indian Survey, and would be able to give some interesting information respecting the mode employed of producing the excellent maps of that country, some of which were on the table. He said that it often struck him that those who used maps seldom reflected on the trouble which it took to produce them, or of the perils which often had to be endured before a line could be engraved. Those who were employed on such work in uncivilized countries had, indeed, no easy task, and deserved the best thanks of those who availed themselves of their labours. He would not take up the time of the meeting with any further remarks, but would ask Captain Holdich to read his paper.

It has been rightly said that geographical discovery is the heritage of this century. One of the most direct, if not the first, results of geographical discovery is geographical map making, and in the wide sense in which all geographical maps lend themselves to military purposes, the geographical map and the military map may be classed together.

By a geographical map, I mean a map executed on such a scale as may show all the principal topographical features of the country it represents, all, in fact, that is most essential for the successful conduct of military operations, without including any large share of that which has to do purely with the civil administration or government of a country, such as field measurements for the proper assessment of revenue, or for such technical engineering operations as railway or canal making, having for their object the advancement of the resources of the country. Yet we find now-a-days, that increased accuracy in the construction of the first maps of a country, does, in many cases, supply much of what is necessary towards the development of means of communication through it; nor is there any reason, with a proper system of construction, why these first maps should not answer all purposes, until the country has reached a very high state of development as regards its natural resources, when it is reasonable to conclude that its wealthier stage of existence justifies further out-

lay on maps on a large scale and of an expensive description. I think we shall be justified in calling the first map of any country a military map. It may happen that it is nothing more than the compilation of the routes of various travellers, or it may be a more exact reconnaissance, founded on a mathematically accurate basis, but it generally happens, that the first application of the geographical knowledge so obtained, is one which tests its value more or less from the military point of view, and, indeed, it not infrequently happens that military operations first supply the geographical information.

The exact relations which exist between the topography of the earth's surface and the course of military operations is a deep study in itself. It is not necessary to enter into it here, so long as all military men are agreed that a knowledge of the topography of the country forming the seat of war is of the utmost importance to the General who essays to conduct a victorious campaign, or who wishes to protect a long line of frontier from the evils of constantly recurring border warfare.

For reasons of this nature, we find, in India, that there has been a constant and an ever increasing demand for military maps almost from the beginning of our occupation.

While the Government has been growing in strength and the requirements of revenue assessment and collection have raised a special system of survey which cannot be classed as either geographical or military, and which is more analogous to our ordnance surveys of Great Britain, there has sprung up side by side with it, but totally distinct, a system of topographical surveying, which is purely military in its character, which is applied to all native states and dependencies, and which is spreading yet wider every day over every mile of country into which we can by any possibility penetrate. Commencing some forty or fifty years ago, on the system which is even to this day taught in our military schools and colleges, it has gradually improved in the hands of many able men, owing much to the happy introduction of plane tabling by Colonel Robinson (late Director-General of Telegraphs), till now, though very far from perfect, it has entirely changed its original character, and can claim a high place among the survey systems of the world.

On the other hand, looking back over the same period, it is curious to observe how very little of such geographical surveying has fallen to English military surveyors out of India. It is, therefore, no matter of surprise at all, that we find the same instruments (the same, only vastly improved in detail) in use for military surveying as were in use twenty years ago. The attention of scientific men has never been called to this subject by any special demand for its application, while the demand for more exact and improved scientific methods in numberless other directions has been incessant. But it is no longer so. The first geographical map of any extent that has been undertaken by English Engineer Officers on the English system for many years has just been completed in Palestine, and if this map has been constructed for special objects, far enough removed indeed from any prospective value from a military point of view, yet, who will dare to



say that they can *never* have a military significance in future? That a survey of Cyprus should have been found necessary can be a matter of no surprise to anybody. Indeed, it is not too much to say, that the sort of map which has hitherto existed of that island, is not altogether a bad index of the sort of Government that has prevailed over it. History teaches us that wherever a strong Government gradually lays the foundation of a strong rule, it is mainly by the agency of a perfect knowledge of the country that that rule is established. If we look at the geographical position of Cyprus, with respect to the new formed frontier of Russia in Asia Minor, can the value of a further knowledge of the military features of the wild country that lies between them be any matter of doubt? Have we that accurate knowledge which is so essential, or is it possible that our military map makers may find further scope for their energies here? We have, at any rate, a work of high importance immediately before us in the definition of long lines of boundaries in Bulgaria, Roumelia, and Montenegro, and what does this mean but a considerable demand for geographical map making. Probably no technical survey requires more accuracy than a boundary map. The very essence of a good boundary is that it should last for ever, beyond the reach of a jealous rivalry between border clans, or the more energetic protest of actual border warfare, to alter or disfigure—or of the slow but surer waste of time and climate to obliterate. This can only be reached by making the utmost use of the landmarks of nature. Topographical features of no great significance assume an importance they would not otherwise possess from their very immovability. Yet clearly time and means are all-important considerations in the construction of these maps. They must be accurate, but they must be made quickly, with no large staff of surveyors nor with instruments of the highest class. And this, after all, appears but a small part of what probably lies before us in the shape of military map making. There is more than a whisper that such maps are urgently wanted in Egypt. We know that steps are being taken to commence what must hereafter expand into a most important survey of this class in Griqualand and in the highlands of the Transvaal; nor can we see to the end of all this. Do we know how much of Asia it may fall to our lot to map? All we know now is that there is an ever urgent demand for maps all along the extended border land of India; that never again will a military expedition cross that frontier and return without the security of a good military map; that all through that great debateable land lying to the north-west of our Indian Empire, where geographical knowledge means military strength, it must fall to the lot of one of two great Powers of Europe to secure that knowledge within a few years' space of future time. We see enough, I think, to make it clear that the subject requires our deepest attention—and that now is the time to make certain what system we mean to follow—what promises best to give us the greatest combined advantages of rapidity, economy, and accuracy in the construction of our military maps in future.

One of the best methods (if not the only one) of estimating rightly the value of any future system, is an examination of what may

have been done in the past towards the production of accurate maps under given conditions of time and cost. And here arises a difficulty which cannot be wholly set aside. If systems are to be judged by the maps they produce, how are we to decide either on the abstract or relative value of those maps? There is no such thing as public criticism in the matter. If there were it would probably not be of much value. The widest possible divergence of opinion may exist even among scientific men on the subject. This will always be a difficulty, but we shall, perhaps, arrive at the safest conclusions by an examination of the field sheets of each survey (always bearing in mind that the final maps are but expositions of the skill of the phot zincographer or engraver, and that the field sheets afford the only safe criterion in the matter) on its own merits, with respect to the conditions of time and cost of its construction, and as to accuracy. No two square miles of the earth's surface are probably exactly alike—and no two surveys of any extent can possibly embrace ground of exactly similar characteristics—yet, by a careful comparison of averages, we may arrive at very fair conclusions with respect to the time a survey should take in completion. With respect to accuracy too, there are certain well-known rules and indications that are sufficient to any experienced surveyor to decide the value of the completed work. But with regard to economy, we can never be quite safe in laying down a decided opinion, in saying that this map cost too much—or that too little. We can at best only estimate roughly what should be the cost of a given survey, and it must remain a matter of individual opinion in which the widest and longest experience is likely to lead to the safest conclusions. It is clear, then, that we must have full information about any map that we are looking at, before venturing to give an opinion as to its merits. And here comes the great bar to what might otherwise prove of the greatest value to us in the examination of the maps produced under foreign systems. Even if we could gain the privilege of an actual inspection of foreign field work, we could arrive at no definite conclusion without such information as we are not likely ever to obtain. There are but two countries in Europe that have lately been engaged in geographical work of the nature of that which we are now discussing, viz., France in Algeria, and Russia in Central Asia. But, undoubtedly, England has lately had in India the largest interests involved in geographical work, and the largest experience in carrying it out; and the Indian system, which is undoubtedly French in its origin, and is but a modification of what might be generically termed the Continental system (for it must be remembered that England stands quite alone in upholding a system which is about half a century old) may well be taken for the present as affording the most accessible as well as the widest basis for estimating what is best for the future.

The military or geographical surveys of India must be divided into three distinct classes.

1st. Those exact surveys on the 1-inch scale, which take the place of the ordnance sheets of the same scale in Britain, founded on a rigidly accurate basis, and which are always of such a high average in point

of accuracy as to entitle them distinctly to be classed as surveys, and in the construction of which economy and accuracy have ever been the guiding principles.

2nd. Those military reconnaissances covering wide extents of country, which frequently under favourable conditions might be classed as surveys, but which are often dependent on points whose value can only rank as second class, and sometimes on bases measured in the field having an abstract value of latitude and longitude of their own, and which are always executed under stringent conditions of time, and—

3rd. Those compilations of route surveys executed by picked natives who under various disguises penetrate beyond our frontier, and bring back recorded observations and route measurements from countries into which no European can enter.

The system adopted in the construction of the first two classes of maps is essentially the same, and it may be described in a very few words as plane tabling based on triangulation.

It is strange that it should be necessary to say a word about the plane table, an instrument so familiar to us in India and to every Continental surveyor. Yet it is an instrument of which the scientific use is utterly unknown in England, and it may possibly be as well to describe it. A plane table is a drawing board on three legs, easily levelled and retaining a free motion in azimuth; and to it are generally attached a ruler with sights at either end—one with an eye slit, and the other with a fine hair—and a compass, or magnetic needle, in a long box having a motion through a degree or two on either side of zero, which serves to determine the approximate azimuth of the table. It can be made as portable or as solid as you please, from the weight of an ordinary rifle, to those solid and somewhat clumsy constructions which we use in India, and which we like because it is more comfortable to work with a good solid instrument than with one of a more flimsy construction. The very description of it will be sufficient to suggest its cheapness. If money is expended on it, it is to secure fine finish and a neat appearance without adding anything to its utility.

It is used for the double purpose of triangulation and topography. Passing over its use for the present as a triangulator, the following is the manner of its topographical use. The plane table is roughly levelled and brought into approximate azimuth by means of the compass, so that the points previously fixed by triangulation and projected on it, are nearly or quite in true relation as to direction with the same points in nature on the surface of the country. The surveyor's position is then determined on the board by the simple process of interpolation, observations being taken through the sights of the ruler to three or more of these recognised points. If the three rays drawn along the edge of the ruler meet in a point the azimuth is correct, and the surveyor has nothing further to do than clamp his board and proceed to sketch the country before him by means of a series of observations through the ruler sights all round his position. There is little or no eye sketching about this. The rapidity with



which the true direction of any topographical feature can be ascertained, and marked, by a glance through the ruler sights, and its position verified by the observations from the next fixed point of interpolation, relieves the surveyor from any troublesome considerations as to its exact whereabouts; and it is this exceeding simplicity of use that makes the plane table so peculiarly suitable to the uneducated mind of the native, which is so strongly appreciative of minute accuracy in delineation, but which cannot be trained to that higher capacity for deliberate thought and judgment which sketching from nature involves. Should the plane table not be in true azimuth, the interpolated rays form a small figure, instead of meeting in a point, which figure at once reveals by the very simplest laws the extent of the error and the manner of its correction. So that the plane table becomes entirely independent of compass error induced by local magnetic attraction. It is easy to conclude from this that the plane table is a valuable traversing instrument as well as a triangulator, and the conclusion is perfectly sound.

The ordinary system of carrying out a military survey over any large tract of country is as follows:—The ground is first triangulated from an efficient base, which base, in India, can usually be obtained from one or other of those series of triangles that have been carried through the country by the G. T. Survey along lines of meridian and latitude, and now gridiron it completely. Even in the case of our military frontier expeditions such a base is generally procurable. The triangulator uses a first class instrument, either a 10" or 12" theodolite, and from the very commencement of his work he carries a plane table with him. When time permits the first preliminary reconnaissance of the ground is carried out by a plane table triangulation alone, which definitely fixes the position and number, both of the first class points or trigonometrical stations, and the secondary points or points fixed by intersection from three or more observations, and which becomes in fact the triangulation chart. For a first class survey this preliminary plane table triangulation may be regarded as indispensable. It insures the necessary number and quality of points, and it is of the utmost use in subsequently assisting the triangulator to recognise many of them which would otherwise escape detection even with the most powerful instrument. But it may happen that the excessive wildness of the country, its extreme unhealthiness, or the difficulty of moving about in it, may make the erection of many artificial signals an impossibility; even the selection of trigonometrical stations becomes a difficulty, and the one great point to be gained is, having passed over the country but once, to get out of it as soon as possible. In this case preliminary reconnaissances must be dispensed with, natural features such as hill peaks rising perhaps with painful monotony of form and colour from dense forest-clad plains, become the only available natural landmarks; and trigonometrical observations to them, with weary reiteration from day to day, would lead to a most hopeless confusion in the recorded observations—but for the plane table triangulation which must of necessity go hand in hand with the instrumental one. *Only* in this way could such a triangula-

tion as I have described be carried out. Indeed, I think, that not even by surveyors in India have the triangulating powers of the plane table been fully recognised. There is another important adaptation of them, as we shall see, in the case of military reconnaissances with a field force when other instrumental triangulation fails.

Into the details of theodolite triangulation, I will not enter further than to remark that true economy of time and labour is best found in carrying out triangulation to its fullest possible extent. To attempt first a bit of triangulation, and then a bit of topography, or to make the two go hand in hand can never lead to a large outturn of work. Further, we find that, for 1-inch survey work, about one trigonometrical station for every 100 square miles, and one subsidiary fixed point or signal for every ten square miles, is amply sufficient for topography, by plane tabling, or very much less than half of what appears necessary for any other system of topography from interpolated fixings.

But it is of course mainly in its topographical capacity that we find the highest value of the instrument, and it is in this capacity that we claim for it its chief advantages in rapidity and accuracy—resulting of course in economy—in the construction of maps.

Every one accustomed to the use of the prismatic compass will readily recognise four distinct origins of error in the use of it in conjunction with the protractor.

Firstly, there is the very indefinite error known as compass error from local magnetic influence which may vary infinitely, can never be readily measured, and so far as I know can never be eliminated. I have been in country where the compass would be totally useless from this cause alone. What is to become of one's sketch under such circumstances?

Secondly, there is the error of observation due to an unsteady instrument and imperfect graduation. I doubt whether under the most favourable circumstances an observer can be certain of the value of his observation to half a degree or so.

Thirdly, there is the error in the graduation of the protractor. I will presume that only circular brass protractors are used, when this error may probably be limited to  $15'$ .<sup>1</sup> Ivory protractors are frequently absolutely useless from this cause alone.

Fourthly, there is the error in protracting the observed ray on to the sketch sheet. An inconstant error which increases directly in proportion with the length of the ray.

And if all these errors combine, and the interpolation fails, how are they to be adjusted, even if the surveyor could know exactly how each operates? It follows that observations must be taken to points at close distances, to reduce these errors to reasonable limits, and the triangulation must be close indeed to give the necessary number of points. And if we fix a definite limit to the length of ray, or distance from the point observed, beyond which that point becomes valueless for interpolation, it must be remembered that the number of points that it will be necessary to lay down by triangulation increases inversely as the square of that distance; *i.e.*, for half the distance it will be necessary to fix four times the number of points. Now an ordinary plane

table contains about 480 square miles of mapping on the 1-inch scale, and  $480 \times 16$ , or about 7,680 square miles on the  $\frac{1}{4}$ -inch scale, which is one found most convenient for a geographical reconnaissance with a field force. And if in that large area there are but four or five easily recognised and fairly well scattered points, which need not by any means be visible from every part of the ground included within the plane table limits, but only from positions of important elevation, there is at once a practicable, if not always very adequate basis for topography. The accuracy with which such points can be used as the basis for interpolation is limited only by the skilfulness of the surveyor in the use of his pencil. There is no compass error, for the plane table is independent of it. There is no error of graduation in the protractor, or of subsequent protraction, for the protractor is never used. The accuracy with which the angular observation can be taken with the ruler may be estimated at from 5' to 10'. As 10' subtends 15 feet at a mile, and as 15 feet would generally afford a definite centre at that distance, it may fairly be stated at 5'. This practically introduces no error whatever into the work. But suppose the table is not accurately adjusted in azimuth, an error is at once introduced, which varies directly with the distance. As the distance of the surveyor from his projected points increases, so does this error become more and more apparent; but, as has been before pointed out, its value and the manner of its correction become also more and more apparent with the longer ray, and as it can have but one assignable cause, it is easily eliminated at once. This is why the farthest points are used for reference for adjustment in azimuth, and the nearer ones for the purpose of interpolation. We give an average of one point to each 10 square miles, because an interpolated fixing from near points contains no appreciable azimuthal error, and saves the necessity of fine azimuthal adjustment. But you will observe that this number is not necessary to the accuracy of the work. The skill of the surveyor alone in the use of his pencil limits the degree of accuracy of this method of surveying. As to rapidity anyone who will take the trouble to compare the simple process I have described with that of observing with an unsteady compass, and then projecting with an inaccurate protractor on an equally unsteady sketching case, will have no difficulty in forming a conclusion for himself. It does, in fact, so far as we have evidence to prove it, take less than half the time. The extreme simplicity of the process of working with the plane table, combined with the readiness with which a slight amount of skill in drawing can be utilized when applied to a solid steady drawing-board, make it peculiarly suitable to the native workman. He masters the principles of it at once, has generally a keen sense of what is meant by accuracy, while he has no troublesome angles to recollect, nothing to record. A large share of military surveying in India is done by natives, and it is of the highest importance to remember that if ever for the future we mean to have such maps constructed at a reasonable cost, we must most certainly utilize local native agency. The result of the system is this: admirable 1-inch maps are turned out, often of the highest value in point of accuracy, and always of a high average in this respect, for



about 2*l.* per mile, or at one-fifteenth the cost of the 1-inch Ordnance Survey maps of England; such maps, that is to say, as are produced by reproduction from originals on a larger scale.

But it might fairly be doubted whether the plane table is equally suited to all classes of ground, all natures of survey that military map-making may entail. I think India has very fairly tested its capabilities in this respect, as the wide extent of India presents every conceivable variety of topography that is ever likely to be encountered in the great unmapped world at large. For mountainous districts and open country its value has long been recognized, but it is only of late years that any general use has been made of it in wide flat plains, thickly covered with forest trees and forest grass, where one may ride for a day's journey and see nothing in the shape of a natural landmark without diligent search—plains through which it is hard enough to carry triangulation even, and of which it would appear at first sight impossible to make anything like an exact survey without such an expenditure in clearing lines of traverse as would prohibit the work altogether. But hard necessity has gradually developed the traversing capabilities of the plane table in the hands of experienced workmen till it may fairly be said to meet the difficulties of the position in a manner which is perfectly satisfactory. The hopeless tangle of error which would in some places be introduced by local compass variation renders it imperative to resort to a system which is, if necessary, independent of the compass. It is not possible to describe the various systems of traverse in detail, nor the manner in which possible check is at once brought into play, and errors in every chain measurement detected and rectified on the ground. It is sufficient to say that the system has been brought to a considerable degree of perfection in those wild and often deadly districts which have hitherto remained unexplored over the remoter parts of India—districts such as no geographical surveyor working on the English system has ever yet encountered, and which will, I am sure, crush his system to death whenever he first encounters them, unless indeed he is content to abandon all idea of a survey in favour of a mere route reconnaissance.

It may be asked what *is* the English system? I should have had much hesitation in replying to this, but that all such geographical surveys (amounting to no great sum total all put together) as have of late years been completed by English engineers out of India appear to have been worked on one definite method—the same that was taught in our schools and academies fifteen or twenty years ago, and the same that, so far as I know, is taught in them still. The basis of topography on this system is interpolation by means of the prismatic compass. The only geographical work of any extent at all that has been completed of late years by English engineers on this method is the survey of Palestine, and this survey, though small, is just enough to test fairly a definite system, and to give us some basis for comparison of that system with others. Difficult as it may be to effect such a comparison, there are yet conclusions which are certainly justified by an examination of the separate conditions of its execution in the matter of time and accuracy. Without entering into details which have been already explained

elsewhere, and which must justly be considered as still subject to discussion, there are, I think, two broad conclusions which no one who has made the subject of map making a study can possibly avoid: 1st. That considerably more can be accomplished within a given time by a surveyor with the plane table than can be surveyed by the aid of the prismatic compass, other things being equal, and—2nd. That the best results of the compass system on any extended scale (and I feel sure we shall be right in reckoning that the very best has been made of the system in the present case) can only be a reconnaissance—in the usual acceptance of that term—and not a survey in the strict sense of the word.

I will not waste time in attempting a rather complicated definition, but I will remark that we distinctly claim for our 1-inch military maps of India that they are surveys, and not reconnaissances. There is nothing about them left to the imagination that can be expressed on the scale of survey.

The rapidity with which the true direction, not only of every topographical feature of importance sufficient to be shown on the scale of survey, but even of such minor details as a defined change of gradient in the rise or fall of the surface of the country, can be indicated by a single line drawn on the map, makes it at once more convenient to be exact in such definition than to trust to estimated distances and the general correctness of the eye. It is not everybody who can make a good topographical sketch by eye alone; but it is within the power of anybody who can use a pencil to make an exact survey with the aid of the plane table. In fact, one great reason of the gain in accuracy secured by working with the plane table is that it is highly *convenient* to be accurate. Now the value of this fact in relation to the lower classes (and therefore less highly paid) of skilled labour must be very obvious. In point of economy it is quite beyond the bounds of possibility to argue anything with certainty from such details as we are able to obtain of the rates of expenditure per mile on different classes of survey of late years. We know this—that in India salaries are enormously higher than in Europe generally in the case of all educated labour, and if they are lower per head for mere manual labour, still the necessity imposed by the climate of employing far more of such labour, estimated by the number of men, than in Europe, would tend to balance such difference. We know, too, that the expense of carriage is greatly higher in India than in Europe generally, principally because the surveys of India have latterly been carried through some of the roughest and wildest districts that it would be possible to find anywhere on the earth's surface; and yet with all these additional inducements to exceptional expenditure, it seems (on such general estimates of the cost of field work, not of the final maps, please observe, as we are able to obtain) that the cost of recent geographical surveys conducted by English Officers is very nearly, if not quite, as great per square mile as is the cost of our geographical surveys of India. But while admitting that the utterly different conditions under which such surveys have been conducted must greatly tend to invalidate any certain conclusions on the subject, there are just these general points which it would be

well to consider. First, that the cost of triangulation must certainly vary with the number of points that are to be cleared and laid down. The fewer such points the less will be the cost. And, secondly, that if, other things being equal, a man can turn out three or four square miles of topography where he only turned out two before, again there must be a corresponding decrease in expenditure. Still I would prefer to state it as a matter of conviction, rather than of proof, that plane tabling is the cheapest form of topographical mapping that is known.

But it is the application of the system to those wide geographical surveys which are now regarded as one of the most important results of our Indian frontier expeditions, as they are indeed of any expedition into new and unmapped countries, that the value of the plane table system is best and most fully experienced, because it has placed within our reach the means of gaining great results in a short space of time, such as never could be gained in any other way. To reduce to the order of a scientific map the wild chaos of mountain and valley, where interminable ridges and peaks bewilder the eye, depressing one with the sense of vastness and infinity, when the only basis for the work consists of a few wide-scattered peaks, eternally bound in snow and ice, secure for ever from the approach of the surveyor, is no small result to achieve, even in these days. And it is no small system that helps us to such results. We must have first a wide expanse of sheer map—a good broad sheet of drawing paper, in fact—in order to include within its limits those few peaks—widely distributed points, which have been previously laid down by triangulation—which may be all that can be given as the skeleton or framework of that which is hereafter to be a completed map. And next we must have a system which admits of minute accuracy of detail, free from the disturbing influence of terrestrial magnetism, or we shall not be able to reduce the scale sufficiently to admit of this wide area within reasonable limits of space, and still turn out a valuable map in the end.

All along our Indian frontier, from Beloochistan to Bhootan, there have been fixed from time to time, as opportunity has arisen, notable points and peaks in the great Himalayan chains, from short bases near the frontier immediately connected with the great triangulation system of India. These are the points referred to which enable the topographer to take his place at once in the field, and with no preliminary base measurements or triangulation further than his own plane table can secure for him, to map out the country right and left wherever he can obtain a footing. Until lately it was considered sufficient to have the line of route taken by the advancing force carefully traversed and measured, and to secure perchance here and there the position of some fine natural landmark to serve as a future guide. And although modern improvements in the smaller class of theodolites, and a wider experience of geographical surveying, have enabled us long ago to ascertain the exact position of many such remarkable points, yet, when all was done, and the routes and peaks adjusted and compiled, we had but the skeleton of a map after all. We had learned much of the highways, and nothing of the byeways of the country we explored. And yet the byeways



of these trans-frontier lands are just what we want most to know about. It is a knowledge of byeways, a topographical knowledge, in fact, that gives a Commander that power of making flank movements and of rapid concentration, which is all-important in modern warfare. And so the surveyor of the present day must give in results in sheer hard topography. If he accompanies an advancing force he must take his opportunities, of course, as he can get them, but his first general principle is to be always off the main route (of which it is easy enough to get particulars) and never on it, hard of constitution to make the most of a day's work, careful to judge where he may obtain the greatest results with the least expenditure of physical labour, keen to obtain the first information as to what is secure for him to reach.

Admirable work of this sort has already been turned out by many Officers of the Indian Survey Department, notably by Colonel Godwin Austen, of the Bengal Staff Corps, and by Captain Woodthorpe, R.E., at present with the Afghan force. And for the future, we may rest assured that we shall never turn our backs on a new country once entered, without a very fair knowledge of what we are leaving behind, a good security, indeed, for the success of whatever policy we may in future adopt towards it. But the military expeditions of the present day are short and sharp, and the surveyor can never reckon on working, except under cover of an advancing force. He can rarely be left behind, and will usually find his opportunities close when the main purpose of the expedition is once accomplished. Time, or in other words rapidity of action, must be his guiding principle, and so it has come about that this, the most rapid system of executing topography that has yet been devised, is absolutely the only one that can possibly yield the results which modern science demands.

It may not be uninteresting to glance at the map of Afghanistan and see what possibly lies before us, in a not remote future, in the nature of military map making.<sup>1</sup> It can hardly be doubtful to whose interest it must be to possess the earliest and completest maps of Afghanistan, nor that the Government of India will make earnest and strenuous effort to obtain those maps. Without claiming any special knowledge of the subject beyond that which is within the reach of every Officer of the Indian Survey Department, I think I may venture to point out the probable course of such mapping operations, probable, that is to say, with due regard to all the thousand contingencies of campaigning which always at the last leaves the actual moulding of events in the hands of the ready-witted few who turn circumstances as they occur to the best account, irrespective of preconceived ideas and plans. We have, in the first place, already recorded the true geographical positions of many important peaks that surround the probable lines of route to Kabul, and these can be projected on to our plane tables, and give us our requisite basis for topography. We have, it is probable (I cannot state this from personal knowledge), a very fair reconnaissance of each of the three main routes we intend to follow,

<sup>1</sup> For maps of Afghanistan, see Generals Vaughan's and Hamley's lectures in this number.

either *via* the Khyber, by the Kurum, or by Kandahar. Further than this, most likely we know nothing. And we want to know, chiefly, what is the true position of the northern boundary of Afghanistan—what are the routes and passes coming from the north over those ice-bound hills, and where do they strike our highways, and what lies beyond Kabul on the north-west, and beyond the Kabul Ghazni-Kandahar route on the west, for a mere glance at the best map we possess (Walker's map of Turkestan, in four sheets) tells us that we know nothing here at all. As far as the two northerly routes are concerned, it will be observed that there is a rough parallelism between the valleys of the Khyber and the Kurum, and that between the two rises an important range containing some of the best peaks on which to base topographical work that a surveyor could desire; grand peaks to interpolate from, but impossible to reach within such short limits of time as will probably be afforded during the advance. No doubt these natural features, which are peculiarly favourable to the work, will be duly appreciated. A force advancing through a mountainous country must necessarily secure command of the hills immediately flanking the route on either side, and whether this is done by friendly arrangement with the hill people, or by military force, there are sure to be opportunities here and there for the plane table to get off the route and reach some tolerably elevated point from which to secure his topography. On each such point, from time to time, his position can (at least between Jamrood and Kabul) be correctly interpolated from points already known, and fixed by triangulation. And if one or two such topographers were working on the line of the Kabul, north of it, and others on that of the Kurum, south of it, the topography of the whole of the mountain range between the two would be correctly laid down, either party being able to see and sketch the reverse slopes of that range with even greater accuracy and ease than those of the minor hill masses on which they were standing. North of the Kabul river, too, it appears probable that a good wide strip of topography would be secured, which would be valuable, not only as the topographical knowledge of the country bordering a route always is valuable, but as most surely bringing to light the position of all routes striking that of the Kabul river from the north, if any exist of which we are not at present aware. But it is in the west and north-west of Kabul itself that the interest of such map making centres. It is quite possible that a topographical route-survey, consistently carried out from beginning to end of the two routes described, would carry its own triangulation in advance of it, and give a good trustworthy basis, even to Kabul for further extension to the great range of the Hindoo Koosh itself. But we may be sure that the basis for such important work as this would be strengthened in every possible way. A base-line might be measured and connected with Peshawur by differential longitudes obtained through the telegraph, which has lately yielded such remarkably good results, or by direct instrumental traverse, such as was the case in Abyssinia, with the various bases there. Opportunity and circumstances decide these matters, and make it unsafe, if not unwise, to speculate

on any imaginary plan of action which may embrace far more than can ever be realized. It is sufficient to say that it will be a work of the highest interest to the geographer, as well as to the surveyor.

But it is not always that such points as those to which we have referred—snow peaks or other fine natural landmarks—can be obtained. English military expeditions range over a much wider field than India affords, and they sometimes (as in Abyssinia and the Ashantee country) enter upon a corner of the earth's surface which has as yet no position of its own in geography, guiltless of anything in the shape of exact measurement, or of an initial base with an abstract value in latitude and longitude. Opportunities of acquiring geographical information under such circumstances are rare, but that such opportunities should be seized for the value that they may subsequently prove to possess (a value, perhaps, not only always to be reckoned or foreseen) is, I think, exemplified in the case of the Abyssinian Expedition. New relations are springing up between England and Egypt; whatever the bond may be that unites the interests of the two countries, that bond can scarcely grow less, and it may grow greater. We have an English Governor in the Soudan—we have a survey of the Nile prepared by English Officers. And will this indirect assistance which England has afforded to Egypt in opening up the resources of a vast continent—which from the superior elevation of our standpoint among civilized nations we are pleased to call “dark”—will it ever be withdrawn? Shall we ever retrace our steps down the Nile? It will be contrary to the teaching of all history if we do. Indeed, we cannot say even now that we have no interest in Egypt or the Nile. And new relations of which we hardly, as yet, know the exact tenour, have sprung up between Egypt and Abyssinia. Now, one of the results of the Abyssinian Survey is this: that 350 miles of watershed, dividing the basins of the Mediterranean and the Red Sea, which carried us along the highlands of Abyssinia from Sanafé to Magdala, is a measured base on the flanks of which are peaks fixed which overlook another great debateable land—which is to Egypt what Afghanistan is to India, a neutral zone which is occupied neither by Egypt nor Abyssinia; but of which a good topographical knowledge would be invaluable at least to one of them. And with these points and some few others, such as might doubtless be furnished by the Nile Survey, the plane table might start to-morrow and bridge over that gap, thereby not only adding something absolutely new to geography, but connecting by direct geodetic measurement the coast of the Mediterranean with that of the Red Sea as far south as Annesley Bay. In Abyssinia there was not even an initial point whose latitude and longitude were known, and in order to maintain anything like an accurate survey along that extended route it was necessary to be exceedingly careful about base measurements to start with. The plan adopted was very simple, and can easily be described in a few words. An initial base was measured with considerable care on the coast of the Red Sea at Annesley Bay. From the two ends of this base which were fixed by a series of careful astronomical observations with good instruments as to their position in latitude, longitude, and relative azimuth, a number of hill peaks on



the ridges adjoining the great plateau, along which the road to Magdala ran, were fixed by trigonometrical observations with a theodolite. It was far more than the limited capacity of the small party engaged in the work (three Officers only, with one non-commissioned officer of the Royal Engineers) was equal to, to carry a triangulation in this way from end to end of the route. So the plan adopted was as follows:— Another base was measured in the same way at Sanafé, the first camp on the highlands, and a third at Antalo, a fourth at Ashangi, and a fifth at Magdala. From each of them a certain limited number of points were laid down, and the ends of these bases were connected by an instrumental traverse which ran right through from Zula to Magdala, and was constantly checked by observations for latitude, which were of peculiar value in a route running nearly due north and south. Now this, it will be observed, was a very good skeleton of a map, but nothing more; the gaps were long between one set of triangulated points and the next, and without adequate topography the map when completed would convey no notion of the nature of the country traversed, nor would even be sufficient to check the doubtful work of those travellers who had done something towards elucidating the geography of the country previously. With those few points the plane table was found to answer perfectly both the requisite purpose of filling in its own triangulation between base and base, and of accumulating topography rapidly and effectively, till the survey was closed by the return of the columns to the coast, and the survey party broke down through sheer hard work. And though the advantages of the geographical knowledge so obtained may still, by some, be regarded as prospective, one cannot but look back with regret on the golden opportunities presented by that remarkable ridge sharply separating and overlooking the great basin of the Nile on the one hand, and the arid hills and salt plains bordering the Red Sea on the other, for the further acquisition of geographical maps, had there been more than two Officers with the force acquainted with the use of the plane table.

And in that branch of military surveying which we usually term reconnaissance, or military sketches, undertaken for the purpose of mapping on a larger scale portions of ground which may be the scene of military manœuvres, or of investigating the capabilities of different routes, work of the nature which usually falls to the Officers of the Quartermaster-General's department rather than to those of the survey: I can see no reason why the advantages of rapidity and accuracy of work should be of less importance than in geographical fields. So far I have referred only to the results of hard experience, and to truths which have been tried and proved; and so, with regard to a peculiar class of work, of which I have only had a small experience, I will speculate no further, even if I had time to enter into this most interesting branch of the subject, than to suggest that whenever and wherever in past days the prismatic compass as a means of interpolation has been used in the execution of such surveys, then and there will the plane table, after a slight experience gained in its use, be found more effective in every possible way. It is indeed most

especially to the offices of the Quartermaster-General's and Intelligence Department that the whole question of plane tabling is of the greatest importance. It is not with any reference to such surveys as our ordnance surveys of Great Britain (except where the scale of survey is very small) that I have endeavoured to make the system of plane tabling understood. It is most essentially adapted for rapid work in the field—no matter what the scale may be—and to such surveys as those now in progress in Cyprus and Asia Minor; and the plane table must be constructed with reference to the work it is expected to do. I have heard an objection urged on the ground of portability. The plane table can be made at least as portable as the prismatic compass and stand. I have had a light one made by Messrs. Troughton and Simms that leaves nothing to be desired in the matter of portability, while still retaining all the fundamental advantages of the plane table over the prismatic compass. I do not recommend one so portable, however, for the purpose of geographical surveys. It rarely happens that it is necessary for the surveyor to convey his own instrument about from point to point; and where, as in a hilly country, the labour of making one's way about is severe, it is by no means advisable that he should be called on to do so. *Comfort* is a not unimportant item of that sum total which leads to successful results. I have heard it remarked with much truth that it is a great thing to be able to *lean on* your plane table, if you wish to do so, without disturbing it. Solidity and stability are advantages decidedly to be considered in choosing an instrument for the field.

So far I have been able to remark but briefly and inadequately on two classes out of three of the military or geographical surveys conducted by English Officers in India. Of the third class, those route surveys undertaken by natives in regions untrodden by, and utterly closed to, the European traveller, I will not attempt an imperfect description. It is a new and most deeply interesting branch of geographical research, only imperfectly understood as yet, which I mention chiefly in the hope of securing the attention of geographers and travellers to it. Wherever we have a base or line of frontier from which to start, or from which a current of trade however small, by means of caravans or otherwise, ebbs and flows through unknown regions beyond it, there is undoubtedly our chance of utilizing that latent power possessed by the native of every class or kind for adapting himself to disguise, and for the patient performance of feats of endurance in the reckoning up of paces day by day through each long day's march, which is certainly not shared in a like degree by the European. The best respect we can pay to the memory of such men as Montgomerie (whose name all geographers must recognise) is to study the legacy of experience which he has left us. What has been done in Asia can surely be done in Africa. There are no tales of pluck and enterprise in connection with our trans-frontier explorations that have not their parallel in the many stories of African travel. I cannot believe that India possesses the monopoly of such men as the gallant old schoolmaster of Kumaon, Pundit Nain Singh, who has recently been recognised by the award of the highest honours that the Royal

Geographical Society can bestow. Who can doubt that herein is a great latent power as yet unutilized and undeveloped, that is awaiting the first practical mind contented with the humbler *rôle* of compiler rather than that of discoverer to develop into a valuable aid to geographical science?

With regard to the maps on the table before you, I may remark that they all of them represent work done by plane tabling. I much regret that I cannot procure specimens of original field work. The necessity of drawing maps with a special view to reproduction by some process involving photography has had a most unhappy tendency to reduce the art of topography to one monotonous level of dull mediocrity. Amongst our original sheets are to be found many really artistic specimens—truly artistic in the sense of being so true to nature that the geological formation of the country is distinctly recognisable in the topographical delineation. But these finer effects of art are sadly apt to disappear in the process of reproduction. On the other hand we know that a skilful artist may make up a very presentable map from very slender material, and the fiction may be barely recognisable in the photozincograph. Of those before you I can guarantee that the originals *lose* rather than gain in the reproductions, and there are one or two to which I would invite special attention.

1st. The sheets from the *Karte Federale Suisse*, kindly lent me, together with the French sheets, by the Marquis de la Ferronnays (who will, I trust, shortly address you on the subject of plane tabling in France), which are exact reproductions on the same scale as the plane table sheets.

2nd. The first plane table maps ever executed in India by Colonel Dan Robinson, R.E., for which—with others—I am indebted to the kindness of Mr. Trelawney Saunders, the chief of the Geographical Department of the India Office.

3rd. The maps of Ajmere and Simla, on the scale of 16" and 24" to the mile—which represent the largest scale work done by the aid of the plane table, executed by Captain Strahan, who will also, I hope, have something to say this afternoon.

4th. A sheet of the survey on which I have recently been engaged in the Central Provinces, which is of interest as it shows what may be done by traversing in a particularly wild or deadly country, through forests that effectually obscure the view and shut out all fixed points from direct observation.

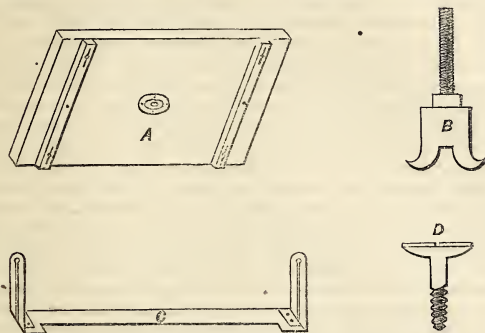
In conclusion, I must express my sense of having dealt very inadequately with a subject of exceeding difficulty. This difficulty lies in so balancing the merits of different systems, which must in all possible circumstances of application vary as infinitely in the conditions under which they are applied, as one part of the earth's surface in all its physical and human relations varies from another, as to strike evenly between them and point out conclusively that one is better than another. Nor should I have attempted it but for the one great fact of the perfect unanimity of scientific opinion on the subject, wherever that opinion has been based on fair trial and experience. It may be



said that in India, and on the continent of Europe, a system has been elaborated and perfected by practice, under opportunities such as have never been afforded to English surveyors out of India, and that such small amount of geographical work as has been done by them cannot be fairly taken as a test of the merits of the English system. But there is this to be noted, that in India our present system is but the riper and, as we are pleased to believe, more perfect outgrowth of the older one. The old military maps of India of from twenty-five to forty years ago were constructed as the maps in Syria have been constructed lately. Those old military maps are no small source of grief to us even now, and yet they were completed by most able and scientific men. But with increased and wider experience and the application of much thought to the subject, we have arrived at the point of adopting the system of plane tabling until it forms the very backbone of our work in every field, and has established itself in the good opinion of our scientific topographers to an extent that could hardly have been foreseen even by Colonel Robinson when he introduced it. His own views of the subject will be found in an excellent appendix to General Thuillier's "Manual of Surveying for India." Now, if we are not all wrong in our conclusions, and if it is true that as in certain directions we claim that the plane table affords the *only* means of meeting the requirements of the day, so in other directions, we, in common with the scientific surveyors of all Europe, are right in assuming that it is the *best* means, does it not follow that a general knowledge of the use of the plane table would be a great advantage gained by our military men? Is it quite satisfactory that when topographical maps of a large extent are suddenly required under urgent conditions of military importance, that the strain of this, the hardest work that any military man can engage in, should fall entirely on the back of the already overstrained Survey Department? I am not at all unaware of the valuable work executed by the Officers of the Quartermaster-General's Department, but why should not their scientific capabilities be stretched a good deal further in this direction?

The sum of all the weightiest objections urged against the plane table that I have as yet heard may be expressed thus:—"We do not know the use of it." It is an objection most easily overcome; the time occupied in learning the use of it is so short—that which is to be learned is so simple—the expense of the instrument is so small—that surely it could be taught in our schools and academies as well as the usually adopted methods of military map making without detriment to any them. This, at any rate, would be the beginning which promises best to overcome the well-known *vis inertiae* of long established habit and custom, and to give plane tabling a fair start among English military map makers.

<sup>1</sup> "A Manual of Surveying for India, detailing the Mode of the Operations of the Trigonometrical, Topographical, and Revenue Surveys of India." Compiled by Colonel H. L. Thuillier, C.S.I., R.A., and Lieut.-Colonel R. Smyth, late Bengal Artillery. 1 vol. Large 8vo. Calcutta, 1875. 3rd edition. Note, for full particulars of the use of the Plane Table, see Appendix to the above work.—ED.

*Description of a New Plane Table in use with the G. T. Survey.*

A. Shows the under part of the plane table, with the brass socket-screw in its centre, countersunk and fixed by four screws. The board is made of planks of well-seasoned toon or deal wood, one inch thick. To prevent warping, edge-bars are attached across the grain. These edge-bars are to be fixed firmly by one screw in the middle. There is also one screw at each end, passing through a long hole, so as not to impede expansion and contraction. These latter screws should have broad heads, and should not be screwed too tight, and the shoulders should be slightly bevelled, or turned off, so as to offer the least possible resistance, as in D. Moreover, a piece of brass or tin should be placed between the shoulders of the screw and wood, to prevent counter-sinking, which would prevent the expansion and contraction of the wood. After being made up and well aired and seasoned, the surface of the board should be planed true and smooth.

B. Is the screw for fixing the table and the stand.

C. Is the sight-rule for plane table.

*General Remark.*—Iron is inadmissible on account of the compass.

Captain the MARQUIS DE LA FERRONNAYS, French Military Attaché: In complying with Captain Holdich's kind request, I must first of all claim your indulgence, for, when I spoke a few words the other day at Chatham, I little thought that I should have to repeat them before members of this world-renowned Institution, and I am obliged to use a language which is not my native tongue. What I said at Chatham was that the large ordnance map of France, at the scale of one to eighty thousand, was entirely surveyed by means of the plane table. Some parts were so surveyed directly and others indirectly, and for the following reasons. At first it was decided by the Committee, composed of scientific and military men, who had been appointed to study the best system for making such an extensive map, that after a network of triangles had been drawn over the country by trigonometrical and geodesical observations, the topographical survey should be made by the Officers of the *Ingenieurs Geographes Corps*, by means of the plane table. The work began on that principle in 1817, but proceeded rather slowly; the streets of Paris, Beauvais, and two or three more were prepared in this way. Two years later, an important modification was made, which had the advantage of allowing the surveys to proceed with a far greater rapidity. When the revolution at the end of the last century brought taxation to bear on all landed property, it became necessary to form a perfect parish map, where every division of property should be distinctly indicated. This map, which was on a very large scale, was made separate for each parish, and a special network of triangles was drawn over each separate "canton," so that the only community existing between these maps all over France was the scale and the process of execution, as the surveys were entirely conducted with the plane table and

the chain. In 1819 this *cadastre*, as it was and is still termed, was far from being completed for every one of the 40,000 parishes in the country, nevertheless it was decided that, wherever the *cadastre* was available, it would be made use of by the Officers of the Ordnance Survey Service as a general outline, which would only have to be completed. To enact this principle, the following regulations were made:—

1. In each parish the *carte d'assemblage*, or general map of the parish, on the scale of  $\frac{1}{100000}$ , which opens the atlas of the parish, should have to be reduced carefully to the scale of  $\frac{1}{400000}$ , which has been selected for the Officers' surveys in the field;
2. Each Officer had to complete this reduced copy by means of the accurate information always gathered by the tax collector, for financial purposes;
3. Each parish map so prepared was then cut out with scissors, and pasted on a sheet of drawing paper, called *feuille minute*, on which the lines of longitude and latitude had been previously drawn, and the trigonometrical points marked. By means of a needle put through these points on the map and fixed on the corresponding points of the *feuille minute*, a perfectly regular portion was secured for every one of these parish maps, and what little survey remained to do, being merely "detail," was then surveyed with prismatic instruments. But, in fact, as the general principle adopted was the plane-table surveying, and as the *cadastral* map was surveyed by means of this most simple process, it may be said that the ordnance map of France has been entirely surveyed with the plane table. In Algeria, wherever the *cadastral* map did not exist, which was the most frequent case, and in other more or less civilised countries where we have been of late surveying without having as a basement, I might say, to our surveys, any previous accurate topographical information, it has always been the plane table we have resorted to.

Later on, in the course of the discussion, Captain de la Ferronnays said, in answer to a question put by General Crawley: The instrument is called the *boussole Houssard*. It consists of a small compass, with a mirror in the lid and a pin on the edge of its square box; the mirror is marked with a vertical scratch, and the instrument must be so held that the image of the pin falls on this scratch. Then, by turning round till the image of the point, whose magnetic direction is required, falls also on the scratch in the mirror, the needle shows the angle on a dial, and can be stopped by acting on a small spring as soon as the image of the pin and that of the point come together on the scratch in the mirror. I have always found this instrument the most convenient for observations on horseback.

Major-General BOILEAU, R.E., F.R.S.: Sir Lintorn Simmons and Gentlemen: It has been my good fortune, through the kindness of Captain Holdich, to have had the opportunity of perusing the admirable lecture which you have just heard, before coming into this theatre, and having given it a very careful study, I am bound to express my opinion that Captain Holdich has stated his case with such clearness, has argued it so completely, and has proved it so satisfactorily that he has bound criticism. Plane tabling is not intended by the lecturer to take the place of trigonometrical surveying, or for field measurements for assessments, or for technical engineering operations, though, as respects the former, the system is capable of great accuracy in triangulating, as well as in mapping the topographical features of a country. The system here advocated formed a part of the education, at our Military Academy, for many years, but was confined chiefly to filling in, and for this purpose it is described in a work written for use in the Royal Military College, at Sandhurst, as one of the best and most convenient instruments we have; but of late years its application has been greatly extended, and we have seen, in the maps lying on the table, that it is capable of producing, in skilful hands, maps of the most perfect and complete kind. Lectures, given in the theatre of this Institution, have not unfrequently included subjects of great value and importance in the various departments of military science, and it is to be hoped that the attention of the authorities may be drawn to the great benefit which will result by the introduction of instruction in plane tabling, in its extended application to military map-making. The instruction might be given at Woolwich, Sandhurst, and at Chatham, and should be considered as part of the course which is to qualify for appointment at examinations for commissions, and not to be learned after joining the Army and entering on a career of active service, either in India or Europe. The Quartermaster-General's and Intelligence Departments would do well to make the subject their especial study, and until the system



of plane tabling shall have been introduced as a part of the curriculum to qualify for commissions, it is most desirable that young engineers should be instructed in the use of the plane table, when they go to Roorkee, so that they might be indented for the purpose of military map making, as in the various parts of Afghanistan, through which our forces are now proceeding—a work for which the supply is furnished from the civilian members of the Survey Department of India.

Major WEBBER, R.E., said that, in spite of the last work of General Boileau, he ventured to get up and advocate the cause of the prismatic compass. It was the instrument with which most of them had been taught military topography, and much good work had been done with it all over the world. Sir William Jervois, Colonel Colley, and the younger Tylden had sketched many thousand square miles with it, during the earlier days of Cape warfare: sketches some of which he had seen. He himself had sketched with the prismatic compass, often in India, and only on one occasion, namely, on the Gwalior Hills, had he found the least inconvenience from the influence of local magnetism. He had also instructed cadets in its use daily for five years, and could speak from experience as to its usefulness as an instrument for instructional purposes, and he believed that, in this respect, it was superior to the plane table, as its use made the learner think, observe, plot, and sketch under circumstances more analogous to the realities of service than if they had the assistance of a steady surface resting on a tripod stand. He hoped that the day was far distant when our young aspirants to the rank of Officer in the British Army would be taught military surveying with the plane table. For filling in a triangulation in a survey in which a less amount of accuracy than by chaining is required, and when the surveyors possess a low order of intelligence, the plane table finds its proper sphere. For the filling in of the Ordnance Survey its use has long been abandoned, because the far more accurate means, namely, by chaining, had been immeasurably superior. He might be permitted to explain why the plane table was so much used in France, having had an opportunity, long ago, of making enquiries, when this question was agitated in 1863. The National Survey of France had not proceeded in the same order of precedence of operations as our Ordnance Survey. In England, we had commenced with our great and minor trigonometrical triangulation, and then filled in, first for the 1-inch with less accurate means, and then quickly we had adopted the system of chaining for all the subsequent scales. In France, long before a really accurate trigonometrical survey had been made, excellent parish and commune maps, made with the plane table, existed already, and when the survey of the country was undertaken by the nation, these plane table maps were largely used for filling in the triangulations. He had no hesitation in saying that, whether on horseback or on foot, the rate of progress of making a military map depends far more on the portability of the instrument and the skill of the sketcher than on the mechanical convenience which the plane table afforded. Two skilful sketchers, mapping on the scale of, say one inch to a mile, the one with the compass the other with the plane table, each produce maps in the same time which, if compared, would not show differences greater than the breadth of a pencil line. And what more, he would ask, is required in most military maps? Any one who had learnt the art and practised it, with the prismatic compass, would be able to use the plane table for greater accuracy, with a day or two of practice, and also would have a better foundation for that higher conception of the art, called “eye-sketching,” which really meant being almost, not quite, independent of observations, so little taught and practised since the days of Jarry and High Wycombe.

Mr. HADDAN, M.I.C.E., said that the lecturer had omitted the most important recommendation which could be advanced in favour of the plane table when placed in inexperienced hands, viz., that the user is able to judge to a nicety the amount of detail the scale requires. In ordinary surveying many years of practice were necessary before the surveyor knew precisely what to survey and what to leave out. In Turkey he put the instrument into the hands of inexperienced persons, and found very little to find fault with in their work. Major Webber pointed out the inconvenience of the facilities for “fudging” which the plane table certainly afforded; and to avoid this he (Mr. Haddan) procured gray-coloured enamelled cards, and which were indelibly scribed with a sharp pointer, as a substitute for the paper and pencil. These cards were also unaffected by weather, which Mr. Haddan believed was one

of the main causes of the work by plane table being given up in England, where the climate is certainly not favourable to outdoor draughtsmanship.

He thought that sufficient distinction had not been given by the lecturer to military surveying proper, as against permanent surveys conducted by military men. One required portable and approximate instruments and treatment, and the other, especially for the triangulation, called for permanent towers of observation, &c., &c., and the greatest nicety. Military surveying might, as in Turkey, consist of diagrams showing the number of hours' march between each point,<sup>1</sup> while map making proper required all the distances plotted as the crow flies, and not as the soldier marches.

For obtaining angles for triangulation purposes with the greatest nicety, and with a small instrument, Mr. Haddan has invented what might be termed a time theodolite, in which the telescope revolved by clockwork. One revolution might be an hour, a day, a week, or a month, according to the acuteness of the angles or the amount of accuracy required. The number of beats of the pendulum balance during one complete revolution gave the divisions of the circle to a degree of perfection impossible in the largest or most accurately divided vernier theodolite.

Major-General CRAWLEY: Sir Lintorn Simmons, I trust I may be permitted to express the very great surprise I feel at some of the statements made by Captain Holdich, in the very able and interesting lecture he has just delivered before this meeting. I am indeed astonished to learn that surveying with the plane table "an instrument so familiar to us in India, and to every Continental surveyor" is yet "one of which the scientific use is utterly unknown in England." The gallant lecturer, further on, speaking of the expedition to Abyssinia under Lord Napier of Magdala, says, "English military expeditions sometimes . . . enter upon a corner of the earth's surface . . . guiltless of anything in the shape of exact measurement, or of an initial base, with an abstract value in latitude or longitude. Opportunities of acquiring geographical information under such circumstances are rare, but that such opportunities should be seized for the value they may subsequently prove to possess, is, I think, exemplified in the case of the Abyssinian Expedition." He then proceeds to describe the results of the Abyssinian Survey, which, as he says, ended in producing a very good skeleton of a map, but nothing more, "which, when completed, would convey no notion of the nature of the country traversed, &c.;" and he adds, "one cannot but look back with regret on the good opportunities presented . . . for the further acquisition of geographical maps, had there been more than two Officers with the force acquainted with the use of the plane table."

Now, sir, it is forty odd years ago since I was a cadet at the Royal Military College at Sandhurst, and it was then the rule that every cadet, as soon as he had acquired the art of delineating the features of ground according to the horizontal method, was placed in the surveying class, under Professor Burr. The classes were formed at the beginning of each half-year, and the course of instruction was commenced with a five-inch theodolite and chain, with "offsetting" staff, going through the whole of the operations of a regular survey of the Hartford Bridge Flats, or the Easthamstead Plain, within a few miles west and north-east of the College. A series of triangulations were made with the theodolite, and the roads surveyed with the theodolite and chain, and the bearings, angles, and distances measured recorded in our field books, whence they were protracted, plotted, and laid down on paper in the Hall of Study, under the superintendence and instruction of Mr. Burr. These skeleton surveys were then transferred carefully to our plane tables, and we were then taken out again, and instructed in the mode of filling in the "skeletons" with the contours of the hills, the hedges, and enclosures, and all the minor details of footpaths, byeways, rivers, and watercourses, &c., &c., forming when completed a *map*, more or less accurate, according to the care and attention bestowed on it by the pupil. This instruction was conducted by Mr. Burr in classes of eight, ten, or

<sup>1</sup> The sun being nearly always visible, and Mussulmans being able to judge time by the sun, and direction by the position of Mecca, even common soldiers are sent as scouts on either side of the line of march, and from their observations very correct diagrams are made. The scale of measurement is two miles an hour, the universal caravan standard of speed.

twelve cadets, twice or three times a week, according to the numbers he had to instruct, and lasted generally for the whole of the first half-year. In the second half-year each cadet considered qualified was furnished with a plane table for his own use, and a tract of country was assigned to him by Mr. Burr, of which he was required to bring in a survey to the best of his ability, and thus almost every cadet who passed through Sandhurst College in those days—certainly every cadet who aspired to obtain his commission—was fully acquainted with the use of the plane table, for this knowledge was an indispensable qualification for a commission.

For these reasons, sir, I am at a loss to understand how it can be said that the “scientific use of the plane table is utterly unknown in England,” nor am I able to realise how in the large force which invaded Abyssinia under Lord Napier, there was only one *surveyor* (the gallant lecturer himself) capable of conducting geodetical operations of any magnitude, and that “only two *Officers* of the whole force were “acquainted with the use of the plane table;” and that those two, as Captain Holdich afterwards informed the meeting, were so imperfectly instructed in it, as to render their assistance almost, or wholly, valueless to him. With the knowledge I possess of the system pursued at Sandhurst, as before detailed, and which I should suppose was equally, if not in a superior degree, pursued at Woolwich Academy, in the education of the “scientific corps,” I should imagine that *hundreds* of Officers in such a large force *ought* to have been found, not only acquainted with the scientific use of the plane table, but even capable of conducting geodetical operations, to have ensured a good and reliable map of the country and of the operations of the campaign.

Lieutenant-Colonel GODWIN AUSTEN: Having served for many years on the Staff of the Indian Survey, I have listened with great interest to Captain Holdich, and first with reference to what fell from the last speaker, Major-General Crawley, I may state that I was first initiated into the use of the plane table at the Royal Military College, Sandhurst. At that time (1851), all cadets were put through a course of instruction in surveying, of which sketching ground with the plane table on a scale of about six inches to the mile formed the principal part of the course, which was then an excellent one. Captain Holdich alluded to the frontier surveys of India. No better example exists of how useful facility, in working with plane table can be, than is exhibited on the map hanging before us, in the portion of the Kurum valley on the Peshawur frontier from Thull upwards. In 1853–54 the survey of Kashmir territory, under Captain Montgomerie, had commenced; and it was then decided, in order to give young Officers of the Quartermaster-General’s Department a knowledge of surveying, to attach some of them to that survey party to fill in the topography. Lieutenants P. S. Lumsden, Allgood, and Johnstone were selected, and worked under Captain Montgomerie for a whole summer. When an expedition into the Kurum valley took place in 1855–56, Lumsden, then Deputy-Assistant Quartermaster-General at Peshawur, accompanied it, and together with Lieutenant Garnett, Bengal Engineers, made an excellent plane table sketch of the whole valley on half an inch to the mile scale, which must now be of the greatest value to General Roberts and his column advancing up the valley to the pass at its head, the Paiwar Kothul. This excellent system was, unfortunately, not carried on by subsequent Commanders-in-Chief;<sup>1</sup> but it shows how advantageous it is that all young Officers of the Quartermaster-General’s Department should be trained in the use of the plane table.

Captain G. E. GROVER, R.E.: Though impressed in favour of the “plane table,”

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<sup>1</sup> NOTE.—I did not add, but may now mention, that this system of employing regimental Officers on the survey led to the appointment of three other Officers in 1857, viz., Lieutenants Melville, Murray, and myself, to the Kashmir survey. The fair copy and compilation of Lumsden and Garnett’s plane table work fell to me, then in the 24th Foot, and Aide-de-Camp to Major-General T. Reed, commanding the Peshawur Division. I always attribute my career since then in the trigonometrical and topographical survey of India to the excellent system of surveying and instruction in military drawing, that I went through at the Royal Military College, of which the use of the plane table formed a large practical part.



as a surveying instrument, by what we have heard here to-day, I have been begged by the lecturer to say all that I can against it. I will, therefore, in the rôle of "devil's advocate," urge some possible objections to the use of the "plane table" for all military purposes, and I will do so in the form of questions. 1st. How does Captain Holdich reconcile his eloquent regrets at the loss of "golden opportunities" during his survey operations in Abyssinia, because not more than two Officers with the "force were acquainted with the use of the plane table" (page 991), with his subsequent assertion that "the time occupied in learning the use of it is so short—that which is to be learned is so simple?" (page 994). The use of the much-abused prismatic compass can be taught to Officers in a very short time. 2nd. Is not the plane table (with its tripod stand), compared with the prismatic compass, cumbersome, heavy, and awkward for a reconnoitring Officer to carry with him on horseback? 3rd. If the prismatic compass were altogether superseded by the plane table, how could secret reconnaissances be carried out? No Officer could possibly use so bulky an instrument when engaged on secret surveys; and such duties are frequently required of Officers in Europe since, even in one's own country, it is often unadvisable to let the public know that military Officers are examining and surveying certain localities.

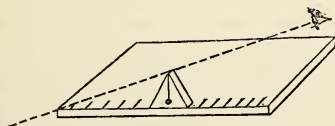
General BOILEAU: With the Chairman's permission I will reply to the remarks of Major Webber. If the system of surveying by compass and chain were as perfect in practice as it is in theory, it would be a good system; but it is subject to so many sources of error, that compared with plane tabling it must be considered as imperfect. It is liable to errors in the angles and distances in the field work, and to those of protraction in drawing the map; and if the work does not close accurately, the discovery of the place where the error has been committed is next to impossible. The safest way of proceeding in the protraction of route surveys is given in my "Traverse Tables," but even by the method there pointed out, the errors of the field work are not, indeed cannot, by any means short of going over the work again, be eliminated. I believe that by the introduction of plane tabling, the chain and compass system will receive its *coup de grâce*, and although for approximate purposes it may receive occasional use for the purposes of correct and extensive map making, it may be considered as good as dead and buried.

Lieutenant WATSON said he thought it was a good proof of the advantages of the plane table, that he had never known anyone, after becoming accustomed to its use, abandon it in favour of the compass and sketching case. Its simplicity was a great advantage, and he could not agree with Major Webber, that the compass was preferable because its use required more intelligence on the part of the person sketching with it. The plane table was really quite a portable instrument, and probably one Officer, with a labourer to carry the table, could do as much work, and certainly more accurate work, than two men using the prismatic compass and sketching case.

Major FRASER, R.E.: Even had Captain Holdich been less successful in proving the value of the plane table, the fact that it is so largely used in India, is alone sufficient to make it desirable that the Engineer Officers at Chatham should all understand its use, because comparatively a large percentage of them may have to employ it in India, or may find it convenient to do so elsewhere. There can hardly be a difference of opinion as to the superiority of the instrument over the compass where it is convenient to use it, as is almost always the case in surveying as distinct from reconnaissance; but I disagree with the opinion that it can entirely replace the smaller instrument. I happen lately to have been employed in military sketching, under the conditions of active service, and I do not hesitate to say, that it would have been impossible for me to have done what I did with the plane table or without the compass. We have the misfortune to live at a time when every one has to learn too much, and the British cadet is, on this head, one of the most suffering of his kind. I think we may assume, that of the 200 to 300 cadets, other than engineers, who annually pass out of Woolwich or Sandhurst, not more than four or five per cent. are afterwards required to use the plane table; while, I venture to say, a much larger number may, on active service, have to use the compass as being the more portable and more generally available. It does not, therefore, seem desirable to inflict a new subject on 95 per cent. for the sake of 5.

It may be of interest to remind the meeting, that the French Military Survey of the Gallipoli Peninsula, the accuracy and excellence of which some of us have had recent opportunities of testing, was done with the plane table.

Captain STRAHAN, R.E. : As I have been employed on the Indian Topographical Survey for the last fifteen or sixteen years, and have used the plane table during that time in many different kinds of country, and on scales varying from  $\frac{1}{4}$  inch to 24 inches to a mile, I should like to add my testimony to that of Captain Holdich, as to the facility, accuracy, and rapidity with which a survey can be carried out with that instrument. There are various little additions to the simple plane table which I have had occasion to use, and which may, for certain purposes, considerably add to its utility. For instance, it is sometimes desirable to know at what angle the ground on which you are working slopes. For this purpose I have had made, of thin wood or of sheet brass, a small equilateral triangle, about 3 inches high, with a little plummet hanging in a groove down its face, very similar in fact to a miniature mason's level. To measure the angle of a slope the triangle is made to stand up on its base (being held by the hand of the observer) and then, the board having been ascertained to be as truly level as possible by means of the plummet, the triangle is moved backwards or forwards on the table, until a straight line from the observer's eye through the vertex of the triangle and the further edge of the board is seen to be parallel to the slope. A properly prepared scale, on which the triangle stands, then shows the angle of the slope. This scale is merely a scale of co-tangents to a radius equal to the height of the triangle. (The following diagram was here shown on the board to elucidate this matter.) In large scale maps



made with the plane table it occasionally happens that it is necessary to use chain measurements ; I have, therefore, added to the scale of co-tangents just mentioned, a scale showing the number of links to be subtracted in chaining on ordinary slopes, and which is used with the triangle in the same manner as the former one. This was found to be exceedingly useful in the survey of Simla, which stands almost entirely on steep hill sides, and where the scale was so large (24 inches to a mile) that a considerable quantity of chain measurement was necessary. The map of Simla referred to is laid on the table before you for inspection. Another simple and useful addition to the plane table is a small sun-dial. This consists merely of a piece of sheet brass cut into a gnomon, with an angle suitable to the latitude of the survey and standing on a brass foot. A dial is drawn on the plane table by any of the methods well known to surveyors, and when the table is adjusted in azimuth, the gnomon by its shadow serves to give the apparent time within a very few minutes. Now, although it does not seem to be a very important thing thus to determine the time, yet the converse problem, viz., having given the time, to determine the board's position in azimuth, is by no means so unimportant, for, by this contrivance, we can set the table up very approximately without a compass at all, using only the rough sun-dial just described, if we possess a fairly good watch showing nearly apparent time. Other contrivances of the kind will certainly occur to workers with the plane table as they may be wanted, and I have merely mentioned these two at this meeting, to show that the instrument is not so limited in its powers as some suppose it to be. For most purposes, both of military reconnaissance and of accurate surveying also, I consider the instrument as unrivalled.

Captain HOLDICH : In reply to the objections that have been urged by Major Webber against the use of the plane table, as applied to ordnance or cadastral surveys, I would point out that I have always endeavoured to make it clear that it is neither for ordnance nor cadastral surveys that its use has ever been advocated by me. I should like very much indeed to see the maps of the Cape Survey referred

to by Major Webber, although final maps can never be accepted as particularly good evidence in support of the system under which they are constructed. The plane table system, as it came under Major Webber's observation in India, was evidently very different indeed to anything that is carried on now in that country, and if Major Webber will take the trouble to reckon up the number of square miles of geographical work turned out in these days by the plane table system in India, he will find that the "partial" (or "limited") application of it, which he admits would be advantageous, altogether outweighs that of all other geographical survey systems put together. Captain Grover has asked, first, how it is that if plane tabling is so easily taught, opportunities were missed in Abyssinia which might have been utilized had there been more than two Officers with the force acquainted with the use of the plane table. I can only say again, from experience, that it is impossible to teach the system (simple as it is) when the pressure of campaigning is actually in force. He next asks whether the plane table can be carried on horseback. It certainly can, as readily as either a rifle or a spear, as you may convince yourself by lifting up the plane table here exhibited. But it is necessary to dismount to work it. If work in the saddle is referred to, then there is a useful little French instrument which seems better adapted to rough reconnaissance than anything we have in England. (The Marquis de la Feronnays here explained, in answer to an enquiry, that the instrument was called the *boussole Houssard*, and showed how it was made use of by mounted Officers.) Again, Captain Grover remarked that the plane table was not adapted to *secret* work. It certainly is not—nor has its use been advocated for such work. This gives me the opportunity of referring to a class of survey in which the plane table has no place, which is carried on in India by trained natives, under various disguises, beyond our frontier; a reference to which was omitted from the lecture for want of time. There is no more interesting branch of our Indian survey work than this, and its importance has been recognized by the Royal Geographical Society, by the bestowal of its highest award (the Gold Medal of the Society) on the well-known native explorer, Pundit Nain Singh, of Kumaon. In reply to Captain Fraser, who is prepared to admit the advantage of plane tabling instruction at Chatham to our Royal Engineer Officers, but does not see the value of its further extension, I would point out that there is a very large survey in India, called the Revenue Survey, which is conducted entirely by Officers who are *not* Engineers: and that even in this survey the plane table has a modified place. Nor does the fact to which he refers, that so little time is given to instruction in surveying at Woolwich, much affect the question. If it is but one day's instruction out of the 365 of the year, it would be well to teach whatever may be proved to be the *best* system during that one day. Major Webber remarked that the compass error was comparatively inappreciable. I have taken some trouble to show that the resultant error of using the compass and protractor *may* amount to at least one degree. Now, one degree of error becomes appreciable at a *very* short distance indeed. Under no scale of survey could it well be called inappreciable.

General Sir LINTON SIMMONS, in conclusion, said much as follows: From what has been said in the discussion, it seems to me that there are circumstances, such, for instance, as the necessity for secrecy in work, that would prohibit the use of the plane table. I have myself, in a survey in North America, been obliged often to climb up a tree to recognize points which I could not otherwise see. I do not quite see how the plane table would meet this difficulty either. But by far the weightiest objection that might be brought forward seems to arise out of the observations that have been made, to the effect that plane tabling was once taught in our military schools and was abandoned. There must have been very good reasons for giving up instruction in its use. I am myself in favour of instruction in sketching by eye, without the use of any instruments at all, for the construction of military reconnaissances and maps of position; but still I quite agree that the plane table system may have a valuable application, where wide maps are required of a country which has already been secured by an advancing force. Under such circumstances I think the system would be a very good one indeed. But, whatever we may think about it, I am sure we shall agree in thanking Captain Holdich for his lecture.



## LECTURE.

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Friday, December 6th, 1878.

MAJOR-GENERAL SIR HENRY C. RAWLINSON, K.C.B., F.R.S.,  
in the Chair.

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### AFGHANISTAN AND THE MILITARY OPERATIONS THEREIN.

By Lieutenant-General J. L. VAUGHAN, C.B.<sup>1</sup>

AFGHANISTAN is a country which must always possess the deepest interest for Englishmen, no less from its past than from its present history, and because it is only through its historical mountains and passes that an invading army is likely to threaten British India. If we think of its past history, our minds recur to the now triumphant, now disastrous, and yet again triumphant episodes in our military annals, of which it has been the scene. We conjure up again in our mind's eye the march of that great unwieldy column, which wended its laborious march through the defiles of the Bolan and the Khojuck, under Sir John Keane; which staggered into Candahar with an almost exhausted commissariat, and which, refreshed and reorganized, again resumed its painful march on Caubul, halting to reduce, by a brilliant and almost untried device of war, the supposed impregnable stronghold of Ghuznee. We see our comrades of the last generation of Officers settling themselves down in treacherous quietude to the routine of ordinary cantonment life in the straggling cantonment at Caubul, or preparing to endure the hardships of the approaching winter in the recesses of the Hindoo Kush. We hear the whisper of the gathering storm which was presently to wreck a British Army in the passes between Caubul and Jellalabad: we see the body of our murdered envoy exposed, mutilated, and headless in the great Bazar of Caubul: and the corpses of 800 British soldiers lying stark and bloody on the snow of the Khoord Caubul, and Jugdulluk Passes. Then, again, changing the field of vision, we see the "illustrious" garrison sallying forth after its five months' beleaguering, and dispersing to the winds the boastful besiegers; and Nott, calm and

<sup>1</sup> Read in General Vaughan's absence by Colonel G. B. Malleon, C.S.I.

resolute at the head of his "beautiful regiments," maintaining himself with never-failing courage within the feeble walls of Candahar. Once more, and we see two British Armies, in all the confidence of strength and victory, converging upon the capital, the scene of disgrace, little familiar, thank God, to British soldiers; we see the British colours once more floating on the Bala-Hissar, and we reflect with pride, tempered with the modesty which our previous reverses inspire, that, at least, something has been achieved as a set-off against our great disasters.

And now the "whirligig of time" has brought about that we are again to be brought into fresh and hostile relations with Afghanistan, and that the twice-forced defile of the Khyber is again to be trodden by British troops. It has seemed, therefore, to the Council of this Institution, to be proper that an attempt should be made to place before its members, and in some degree before the public generally, such information, in a succinct form, as may be available on the subject of Afghanistan, and such facts as may serve to instruct public opinion as to the nature of the difficulties our Generals and troops will have to encounter, and the best and most likely means which may seem available to overcome them.

It is right that I should, at the outset, remind you that it does not come within the scope of lectures given at this Institution, to discuss matters from a political point of view. No doubt we all have our own opinion as to the wisdom or otherwise of the policy which has been pursued of late years towards the rulers of Afghanistan, and the manner in which possible, and as the event has shown, very near contingencies, have been dealt with. No doubt in this assemblage many are of opinion that too long continued indifference to the course of Afghan inclination and foreign ambition has landed us in difficulties, the magnitude of which all thoughtful men perceive. Others again, perhaps a minority, will think that if the indifference to which I refer had only been persevered in, the present state of things would not have arisen. Both sides of the question may be, as indeed all readers of the daily journals know, supported by very strong arguments; and a gallant army of authorities stands arrayed and ready to do battle on either side. With all this, I say, I have nothing to do. I deal simply with events and facts as they confront us this day, and remit to our statesmen and politicians of whatever shade of opinion, the discussion of what might and ought to have been.

Afghanistan, as presented to us in our most recent maps, may be described as a square block of country lying between the 61st and 71st degrees of east longitude, and the 30th and 37th of north latitude. It is bounded on the north by Bokhara and the still independent portion of Turkestan—it would hardly be wrong perhaps to say by Russia. Persia adjoins it to the west: the conglomeration of small States, known as Beloochistan, to the south; and British India to the east. To an audience like this, who may be presumed to know as much on the subject as the lecturer, it would be impertinent to enter into any very minute description of the country. So much I may say, that it is useful to regard Afghanistan as divided into two parts—a northern

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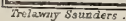




and a southern—a division indicated indeed by nature in the existence of a strongly defined watershed, commencing at the eastern extremity of the Safaid Koh Mountains, and extending westward in their somewhat irregular prolongation at diminished elevation through the high table-land of Ghuznee. In this watershed the principal rivers of Afghanistan take their rise—notably the Caubul river, which flows northward to the capital, and thence eastward to the Peshawur Valley; and the Helmund, which flows south in the direction of Candahar. Northern Afghanistan is a country of high, rugged, and often pine-clad mountains, and deep glens. Southern Afghanistan, on the contrary, abounds in stony, undulating, treeless, and almost desert plains, dotted here and there with oases of cultivation, particularly along the course of its rivers and streams. Such is, I believe, a fair general description of the physical aspect of Afghanistan. To the better understanding of it, it seems to me very desirable to study the most recent map I know of—that by Mr. Trelawny Saunders, given in the last number of the “Geographical Magazine.” In this map, the Safaid Koh is very clearly and, I doubt not, accurately drawn; and the influence of the range upon the physical features of the country north and south of it is very clearly seen. Its principal bearing upon the approaching campaign is, that it separates, as by a wall, the valley of the Caubul river, that in which Jellalabad is, and through which runs the road from Jellalabad to Caubul, which will be followed by the Peshawur column, from the valley and road of the Kurrum river, which it is apparently intended should be used by the small column, the base of which is Thull, and, more remotely, Kohat. The Safaid Koh range, the direction of which is due east and west, throws out, as will be seen by the map, an infinity of small spurs both to the north and south. These northern spurs extend a considerable distance into the plain of Jellalabad; and it is some of these spurs, but at the eastern end of the range, which make that confused complication of mountains, known as the Khyber Hills, and which are pierced by the Khyber Pass. The spurs thrown out by the Safaid Koh to the south are apparently fewer and less regular; but one very marked and important spur is that which gives its name to the Paiwar Kotul (*Anglicé* “steep ascent”), and which is a serious obstacle to a force advancing up the Kurrum Valley. It is here that General Roberts’ column, if it is to be advanced so far, will probably meet its first serious opposition.

I think it is proper here to draw your particular attention to the great mountain barrier which shuts in Afghanistan to the east, and through which a passage has to be sought whether to or from Afghanistan. Though it is usual to consider this barrier as forming part of what we know as Afghanistan, it must be understood that the tribes who occupy the outer or eastern face of the barrier owe, with few exceptions, no allegiance to the present ruler of Afghanistan, and are entirely independent of him. The Momunds, the Afreedees, the Oorukzyes, the Zwymukhts, the Wazeerees, to name a few of the principal tribes of those referred to, are strictly independent. We must deal with them on this footing, and either pay them or force them to







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give our troops a passage to Afghanistan. It is not till we have pierced through this outer barrier of independent mountaineers that we enter upon the subjugation of Afghanistan itself. In the name of humanity, and in view to circumscribe as far as possible the circle of those to whom fire and sword must be carried to obtain our object in setting our armies in motion against the Ameer of Caubul, let us hope that our political officers will use their best endeavours to obtain by conciliation and payments the right to use the roads through the passes up to the point where they cease to belong to the independent tribes.

To complete this short notice of what I have called the great eastern barrier of Afghanistan it will be convenient to call your further attention in this place to the more southern portion of the barrier. In this direction the barrier is formed by the great Soleyman range of mountains and the tribes which occupy it. Geographers are not yet quite agreed, I believe, as to where the northern end of this great north and south range is to be placed. Some consider it as joining almost at right angles the Safaid Koh, in the neighbourhood of the Shuturgurdun Pass, and thence as forming the watershed between the Helmund and the Indus valleys. I think, however, we may leave this question to be discussed by the professional geographers, and be content to say that the great range of hills, call it by what name you will, which extends from the Safaid Koh to Scinde, and divides the affluents of the Helmund from those of the Indus, gives shelter to a number of independent tribes, Pathan in its upper, Belooch in its lower course. And further, let it be borne in mind that these independent tribes will play a most important part in the account, whenever we have to deal with Afghanistan proper.

The great eastern mountain barrier of Afghanistan, of which I have been speaking, and which I should remark extends from the Hindoo Kush, on the north, to Scinde and the latitude of Quettah, in the south, is, of course, pierced by many defiles, serving the purpose of passes or roads. Of these, the best known, as being the most frequented, is the Khyber, which gives the best communication between India and Caubul, the capital of Afghanistan. The Khyber hills are—as I have already incidentally remarked—a tangled web of subordinate mountains thrown off from the eastern end of the great Safaid Koh range, and filling up the angle formed by the Caubul river and the western boundary of the Peshawur valley. It will, perhaps, present to your minds a clearer view of these mountains, which are so interesting to us at the present moment, if I say that, from the eastern end of the Safaid Koh, which I place about 20 miles west of Jamrood, a strong spur is thrown off in a north-easterly direction, ending, after a course of about 20 miles, at the Caubul river. That river, in order to get round this spur in its course to the Peshawur valley, is here forced to make a wide semicircular bend to the north. You will see two prominent peaks shown in this ridge—one, 4,500 feet; and one, in which the ridge terminates, 3,300 feet. Crossing this great spur at right angles is a lesser ridge, which throws out numerous spurs north and south. The southern spurs interlace and mingle with spurs thrown out to the north by a low ridge which may be taken

as an extension eastward, at a decreased elevation, of the Safaid Koh. Between these interlacing spurs a torrent bed has been formed, which drains this small system of hills into the Peshawur valley, and which forms the roadway of the Khyber Pass. This roadway, after a course of some 20 miles from Jamrood, climbs up the main ridge thrown out from the Safaid Koh, which, with an elevation of about 3,300 feet, may be considered to form a minor watershed between the valleys of Peshawur and Jellalabad. It is in the ascent and descent of this watershed that the principal impediment to the free passage of the Khyber by an army is to be found.

You will, I think, expect from me a short description of the road through the Khyber defile, in addition to what I have said above as to the conformation and general lie of the hills through which it conducts. There are two mouths or approaches to the main defile from the Peshawur side, known in the un-euphonious dialect of the country as the Jabaghee and the Shadi Bagiar respectively. The first is, I believe, the true mouth, and that through which the drainage of the pass finds its principal exit. The two roads unite a little south of the fort of Ali Masjid. It may, I think, be taken as certain, from the experience we have had of the passes in the former Afghan war, that any of the flanking hills which it is essential to the safety of the troops or convoy moving by either of the two roads should be crowned, *can* be crowned, even in the face of a resolute enemy, by a determined and active infantry. Wade, when he forced the pass in 1839, at the head of a motley force, the most reliable portion of which consisted of four companies of British Sepoys, and the bulk of which consisted of raw levies and inferior troops of the Sikh Army, pressed unwillingly to aid in an operation which they disliked and dreaded, used the main or Jabaghee road for his principal column, and the Shadi Bagiar for a subordinate weak column under Lieutenant Mackeson. Pollock, on the contrary, used the Shadi Bagiar route for his main column, and sent his Sikh allies by the Jabaghee. Wade's operations were slow and cautious in the extreme, and he reached Ali Masjid in four days, sharply but fitfully opposed, as his loss (22 killed and 158 wounded) showed. Pollock pushed forward with the confidence begot of conscious strength, and with the high inducement of rescuing the Jellalabad garrison from a situation of great danger, and he reached Ali Masjid the same day, with a loss of 14 killed and 114 wounded. When a portion of Wade's brigade was pushed forward to succour the weak garrison of Ali Masjid, it was by the Shadi Bagiar route that it moved, and it was by the same route that Moseley, a few days later, fought his way back to Jamrood. In the first of these occasions Ali Masjid was reached by a night surprise, and it was unnecessary to crown the heights; on the second, Moseley, with two weak and demoralized regiments, had not sufficient men to crown them efficiently, and he suffered accordingly.

The fort of Ali Masjid stands upon an isolated hill in the centre of the pass. Wade described it as 150 feet long by 60 wide, and built upon an angle of the hill, the whole of which seems to have been formerly well fortified. Moseley, two years and a half later, described



it as consisting of two small forts, which are connected by a weak and dilapidated wall. He adds, that it is commanded by two hills of considerable height, of which one is to its south, the other to its west. This last fact is the really only important one, because the fort which our troops knew so well, in the last Afghan war, was blown up by General Nott, before he left the Khyber. It has doubtless been since rebuilt in the ordinary unscientific Afghan way, and will, as a matter of course, be evacuated by its garrison as soon as the advance of our Peshawur column is sufficiently developed to make its defenders apprehensive of being cut off.

The first 3 miles beyond Ali Masjid are some of the worst of the pass, the road lying down the bed of the torrent, and often contracting to a breadth of 40 or 50 feet. At 3 miles a valley  $1\frac{1}{2}$  miles broad is reached, through which the road runs for 6 miles. From this valley the road ascends gradually for 3 miles to the summit of the pass, and is then carried down a most abrupt and difficult descent for 2 miles to the village of Landikhana. In a part of this descent the rock rises sheer on one side, whilst a precipice gapes on the other, the breadth of the roadway being only about 12 feet. There are still 7 miles of pass before the western exit is reached, but the character of the road becomes easier. One and a half miles beyond the western exit of the pass is the village of Dakka, on the bank of the Caubul River, at which place the Khyber is considered to end, and which seems likely to become the position of a British fort. The approximate total length of the pass is 30 or 33 miles according as the Shadi Bagiar or the Jabaghee route is used for approaching Ali Masjid.

The experience we gained of the Khyber and other passes during the British occupation of Afghanistan, and our subsequent enlarged experience in hill warfare as derived from the numerous expeditions which have been undertaken on the north-west frontier since 1850, all tend to establish the conclusion that when the simple precaution is taken of crowning all heights commanding a mountain road before the main column and baggage is permitted to enter upon it, the most difficult country may be passed through by troops without fear of disaster. At first sight the condition of safety above stated appears difficult. It may even be supposed often to be impossible to push an enemy off and occupy a mountain which is held with any resolution, and which has probably been strengthened by breastworks. In practice, however, it has always been found that, thanks partly to some peculiarity in the character of the hill tribes, and partly to the moral superiority which always seems to rest on the side of the attacking party, there are few hills so steep that disciplined and trained infantry, well led, cannot ascend and clear of undisciplined defenders. This has been shown by all previous experience to be particularly true of the Khyber hills, the defenders of which could not even stop the raw levies and half-trained Sikh auxiliaries which Wade used against them, far less the excellent troops which Pollock disposed of. I have alluded to a certain peculiarity in the character of the hill tribes. It is this: like most Mahomedans, they are naturally brave and indifferent to death, and indeed are capable of very brilliant spurts of bravery, though these

are generally shown either when they find themselves very superior in numbers, or when they see their enemy at some temporary disadvantage. But when resolutely attacked, they rarely hold their ground with any tenacity, and are always anxious about their rear; indeed, when we call to mind the ease with which Wade, with about 10,000 most indifferent troops and hardly a half-dozen of English officers, and Pollock, with inferior numbers, though a far better class of soldiers, overcame the resistance of the Khyber tribes, it is permissible to doubt whether we are not erring on the side of over-caution when we contemplate the enormous array of admirable troops now being collected under Generals Browne and Maude for the invasion of the Khyber Pass.

It may be permissible to me to pause here for a moment to notice the remarkable and apparently permanent effect which the Caubul disasters of 1841 have had upon the minds of the English in India, and how the caution inspired by them has coloured all our subsequent military operations in at least the Indian frontier mountains.

No one who is at all read in the non-official records of our occupation of Afghanistan can fail to have been struck with the wonderful confidence in themselves and their men which the Officers of that period exhibited in all the minor operations of the war; and the indifference with which they viewed alike difficulties of country and superior numbers of the enemy. The personal narrative by Lieutenant Barr of Wade's proceedings in the Khyber Pass is one illustration of this. Another is the narrative of the proceedings of a small mixed force sent from Caubul to winter in the Bamean Valley beyond the Hindoo Kush, and which, after several daring little enterprises in that remote and little known corner of Afghanistan, subsequently pushed forward a weak detachment and occupied the fort of Bajgah, far in advance of Bamean. Another instance is the fearless way in which a small force, in, I think, 1839, perambulated the Murrie and Boogta hills under Major Billamore, of which I remember reading a most interesting little narrative called "The First Campaign in the Cutchee Hills," by the late General John Jacob, who was present.

Lastly, I would adduce, as an instance of the self-confidence referred to, the way in which Lieutenant Broadfoot, in 1839, trusted himself to the protection of a Kafila of the Povindah merchants, and marched with it from the neighbourhood of Ghuznee to Dera Ismail Khan, through the heart of the Wuzzeeree hills. We are, perhaps, better without this superabundant confidence, and the more cautious line of conduct which is now the rule may be on the whole preferable; but it certainly affords a most remarkable contrast to the tone of feeling which preceded it.

I must now ask your indulgence whilst I put before you such information as I think will be interesting regarding another entrance to Afghanistan from the eastward. I refer to what is known as the Kurrum valley route to Caubul, now being traversed by the force under General Roberts.

The approach to Afghanistan by the Kurrum valley differs from all the other approaches from the east in that it does not carry us through

a thick belt of independent mountains. On the contrary, an insignificant river is all that has to be passed before our troops find themselves standing in Afghan ground. A glance at the map will show you that the Kurrum River, after taking its rise in some of the more western spurs of the Safaid Koh, runs in a south-easterly course through a tolerably open valley to join the Indus in British territory. This valley, which takes its name from the river, is a valuable outlying province of Afghanistan. It first became known to us in 1856, when, with the consent of the then Ameer of Caubul, Dost Mahomed Khan, a British force traversed it to obtain satisfaction from the Turee tribe for depredations committed in British territory. The late Sir Herbert Edwardes and Sir Neville Chamberlain were much struck with the facilities which the route by this valley appeared to offer for a march to Caubul, and Sir Herbert Edwardes, in a report addressed to the Punjab Government, gave it as his opinion that though the actual roadway of the Khyber Pass may contain no ascent so severe as the Paiwar Kotul, yet that the Paiwar would have the following advantages:—

1. That the Paiwar Kotul is a single hill, to be fought up one side and down the other—an operation of a few hours. Whereas the Khyber has two full marches of the most defensible ground in Afghanistan.

2. That the Paiwar route turns the whole of the Afreedee mountains.

3. That the road being through our own Kohat district as far as the Kurrum country, our communications would be good.

4. That were a large force going to Afghanistan, it would give an alternative route for a portion of it, and would besides divide the resistance.

Sir Herbert Edwardes went on to say that it remained to explore the rest of the Paiwar route from the Kotul of that name to Caubul, and that we should then be able to compare it (the Paiwar Kotul) with the Khyber Pass, and the passes above Paiwar with those above the Khyber, and to ascertain the exact merits of each line.

The distance from the British boundary at Thull (here formed by the Kurrum River) to the Paiwar Kotul, is about 40 miles, and for this distance the road, lying as it does up an open valley, presents no difficulties to the march of troops which need be mentioned. Edwardes made light of the difficulties of the Paiwar Kotul, up which he declared that 9-pounders could be dragged by hand with facility, and that the road could easily be made fit for draught. The descent, which Edwardes only judged from such view as could be had from the summit of the Kotul, he asserted to be “comparatively nothing.”

A few months after Sir Herbert Edwardes' report was written, the onward road from the Paiwar Kotul was traversed by Major (now General) Sir H. B. Lumsden on his way with the British Mission (1857) to Caubul, and by two other English officers—both accurate, and one a most accomplished observer, Lieutenant (now also General) P. S. Lumsden, and Dr. Bellew. It is well for us that Sir Herbert Edwardes' somewhat hasty conclusions as to the feasibility of this route to Caubul were thus capable of verification. The result is that now that the contingency of our desiring to march a force to Caubul



by this route has actually arisen, we know exactly the difficulties it presents, and can judge whether it is within our competence to overcome them. Certain it is that the onward 50 miles from the Paiwar Kotul are perhaps as stiff a bit of road as any to be found in Central Asia.

Premising that the *ascent* of the Paiwar Kotul is not quite so easy as Sir H. Edwardes assumed it to be, and that Major Lumsden considered that some labour would be required before guns could be taken up it even with drag ropes; also that the *descent* was (as Edwardes believed) found to be very gradual, the following will embody his observations on the next 50 miles of the road.

1st March.—Zabbardust Kila to Alikhail, 10 miles. Road along the bed of the Keria stream. On the *left, spurs run down and command the road* from different points *along the whole route*.

2nd March.—Alikhail to Hazardarakht. Road up the bed of the Hazardarakht stream. At 4 miles valley narrows to half-a-mile, *with precipitous, commanding peaks on each side, clad with pine forest*. At eight miles road narrows to 200 yards. From this point the road is *entirely commanded by spurs, and running down from lofty mountains to the bed of the stream*. Encamping ground bad, and would require the troops to be scattered. Guns *would have great difficulty* in this march, owing to the rocks and stones which have been rolled down and settled in the bed of the torrent. No provisions or forage obtainable.

3rd March.—Hazardarakht to Hazra, 8 miles. Road for 2 miles like last march. Thence to Surkai Kotul (5 miles) easier. The Surkai Kotul is short, *but very steep*, and the soil being clay would be very slippery after rain. The *ascent is commanded by hills on both sides*. Heights all round encamping ground would have to be held. Elevation of Hazra, 13,458 feet. It is blocked with snow from December to April.

4th March.—Hazra to Dobundi, 8 miles. Gradual descent for 2 miles *along narrow gorge commanded by peaks all round*, as far as the summit of the Shuturgurdun Pass. *Descent towards the Logur valley very steep, with sharp zigzags*. For wheeled carriages impracticable without vast expenditure of money and labour. The rugged mountains overhanging both sides of the pass, with huge masses of naked limestone cropping out in every direction, *offer cover to an enemy, from which it would be difficult to dislodge him without great loss*, and it would be difficult to withdraw covering parties after the *descent* of the pass had been accomplished. In fact, supposing opposition offered, it is difficult to conceive a worse pass for the passage of an army. From the top of the Shuturgurdun Pass to the village of Akhunkila, road is along bed of a small stream never more than 100 yards broad, with *huge cliffs towering up several hundred feet on each side*. After passing Akhunkila road narrows to 30 feet, and continues very steep, till joined by a stream coming from the north.

5th March.—Dobundi to Khooshee, 9 miles. Road leaves the bed of the stream after 2 miles, and passes over a small, steep hill, called Shinkai Kotul, &c., &c.

Kooshee is from Caubul five marches.

I think those who have given me their attention through the above details of the route between the Paiwar Kotul and the Logur Valley,

will agree with me in thinking that there is no adequate object to be gained in marching a force to Caubul by a route presenting such exceptional difficulties; especially when it is further remembered that one of the tribes who inhabit this difficult country is perhaps the most savage, most ill-disposed towards us of any in Afghanistan. It is fair, I think, to presume that General Roberts's column has been moved into the Kurrum Valley with other objects than to make use of the valley as an alternative route to the Khyber by which to reach Caubul. These objects probably are to occupy an important though outlying province of Afghanistan; to keep employed a portion of Shere Ali's army, and so relieve to some extent the pressure to be brought on the Peshawur column; lastly, perhaps, to steady the great Afreedee clans in the east of the Safaid Koh by showing an inclination to take their country in reverse. If these objects are attained, the employment of 5,000 or 6,000 men in the Kurrum Valley will not have been without effect on the general result of the operations.

There are other passes leading to Afghanistan from the Indus valley of which we have knowledge—in particular what is called the Gomul<sup>1</sup> or Ghwaleyree Pass, which is the pass used by that interesting tribe of nomad merchants, known as Povindahs, who fight their way every spring, in three compact bodies, from the neighbourhood of Ghuznee to the plain of the Indus, and there leaving their wives and children, and young and weakly camels, spread themselves over upper and western India, as far as Calcutta and Kurachee. We are indebted to the enterprize of the late Major Broadfoot for a minute description of this route. He attached himself to the yearly Povindah caravan, in the neighbourhood of Ghuznee, when a young Lieutenant in the Madras Engineers, and travelled with it through all its dangers and adventures to Dera Ismail Khan. From his description it would seem to present no great obstacles barring the hostility of the Wuzeeree and other tribes, through whose territories it lies; but I shall dismiss it, and at least another route known to have been traversed by the armies of the Mahommedan invaders of India, without further notice, because on this occasion it is better to confine ourselves to such routes as come within the field of present military operations.

Nor do I think it necessary to offer any lengthy remarks on what is really the alternative route to the Khyber, both to or from Afghanistan—the Bolan Pass—because, fortunately for the ease of our present operations, that pass is *actually* what some think the Khyber Pass *ought to be*, behind instead of in front of our advanced posts. An advance of 15 miles from Quettah will place General Biddulph's column on Afghan soil.

The situation then is this: the eastern and south-eastern frontiers of Afghanistan are open to attack from three principal different points—the Khyber, the Kurrum Valley, and Quettah. At the two last of these points nature has interposed no obstacle to an advancing army. At the first she has interposed a most formidable barrier in the shape of a

<sup>1</sup> For the positions of the Gomul, Bolan, and Kojuk passes, see the map to General Hamley's lecture in this number of the Journal.—ED.

tangled web of mountains, inhabited by tribes of singular ferocity and barbarism.

It will be expected, in a lecture of this kind, that the lecturer should at least express an opinion on the much-mooted point of whether the hither or the further side of the Khyber mountains is the most desirable boundary for our Indian Empire. In the presence of those whose opinion on questions of military tactics and strategy is received with respect amongst the most military nations in Europe, modesty forbids me to express more than a very qualified opinion. I would say then that if we, the masters of British India, can afford to remain quiescent until hostile legions actually emerge from the passes, there is no doubt that our position behind the passes is strong, and that the present frontier is as good as can be desired. But it is a most sound maxim that the best defence is an "offensive defence;" a defence which is always ready to strike a blow in advance at an approaching enemy; and this maxim, if true, is surely particularly applicable to the case of Afghanistan. It is not so much the actual blow which constitutes the danger here, as the condition of things which would precede and accompany the striking of that blow; the state of unrest which would prevail throughout the whole Indian Peninsula; the doubt in men's minds while the blow was still impending what might be the issue of the coming contest; the hope of successful rebellion which we should flatter ourselves unwisely if we did not believe it might find a place in the breast of many of our feudatories. It is in these considerations that I see the advantages of a frontier beyond the passes; the disadvantage of first having to pass such a barrier as the Khyber before a blow can be struck in advance at the gathering forces of an enemy. To this I know it may be replied that the barrier may be surmounted just as well when the time for striking a forward blow comes, as in anticipation of it. But the forcing of the barrier is in itself an exhausting operation, and to pass it when thus forced might be to leave a wasp's nest behind,—to hinder our communications and to become in turn our virulent assailants if circumstances made it necessary or advisable to withdraw again through the mountains. Better then it may be said to pass the barrier when time and circumstances are in our favour, and to make such permanent arrangements for securing the road as may enable us to use it in safety, even under the most unpropitious circumstances.

So much on this subject I feel that I may be expected to say. We now, however, are dealing with accomplished facts, and for the present at least theoretical speculations may be postponed. Afghanistan has thrown down the challenge to us, and we have accepted it. The Khyber has been forced—not in view to executing a movement of *defence* against an enemy gathering to attack us, but in view to assert the principle that we will admit of no rival in Afghanistan, and that the Ameer must subordinate his policy and his inclinations to our necessities. Three British columns now stand at different points on Afghan ground. The capital, Caubul, is threatened from at least two different points. By one of these columns at least obstacles of ground



quite as formidable as the Khyber have yet to be surmounted. The Jugdulluck Pass, the Huft Kotul, and the Khoord Caubul Pass still block the way to Caubul. Before the Quettah column still stands the Khojuk mountains. Of all these, time permitting, I hope to say something, but whilst the onward course of military operations is still unrevealed, I will ask your attention for a short time to the population and the military strength of the Ameer's dominions.

It is difficult to compress into the limits of this lecture any detailed notice of the various tribes and people who inhabit the Ameer Shere Ali's dominions. A few words however must be said on this branch of the subject.

The population of Afghanistan falls into two grand divisions, the Afghans properly so called, who may be further distinguished as the Pushtoo-speaking Afghans; and the pseudo-Afghans, who use a distinct language—the Persian—and are really of a different race. The first of these divisions again is capable of sub-division into Afghans of pure and Afghans of inferior blood. Of the former the Douranee and the Ghilzie clans may stand as exemplars; of the latter the Afreedees. But these delicate ethnological distinctions would be out of place in a lecture of this kind, and we may content ourselves with noting the two grand divisions above stated—the Pushtoo-speaking and the Persian-speaking divisions.

First among the former, both in numbers and importance, stand the great clan of the Douranees. This clan, to which the reigning Ameer always have belonged, is spread over all that portion of Southern Afghanistan, of which Candahar and the less known town of Furrak are the centres. "The Douranees," says Elphinstone, "are distinguished from the other Afghans by their consciousness of superiority, combined with a sense of national dignity, which gives them more spirit, courage, and elevation of character than the other tribes, at the same time that it renders their behaviour more liberal and humanized." I am not sure that with our present knowledge of the Douranees Elphinstone's estimate of them would be thought quite correct by competent judges. Let that however pass. The Douranees are at any rate the most important clan in the whole Afghan nation, both in point of numbers and of general superiority.

Next in importance to the Douranees come the Ghilzies.

The fighting strength of this powerful clan is calculated by Major Lumsden (who was at the head of the Candahar Mission in 1857, and whose sources of information were of course excellent), at 30,000 men. The country they occupy may be roughly described as extending from the Jellalabad-Caubul road on the north, as far as, or a little beyond, Khelât-i-Ghilzie on the south. Their western boundary is the range of hills which skirts the west of the Caubul-Candahar road; their eastern, the Suleiman range. Within the Ghilzie limits falls the Shuturgurdun Pass, of which we may perhaps hear a good deal presently. The Ghilzies will also doubtless be the principal opponents of General Browne's column in the Jugdulluck and other passes in the probable advance upon Caubul. They are acknowledged amongst the Afghans as the bravest and hardiest of

their race: and our own experience in the first Afghan war certainly confirms this estimate. On more than one occasion they advanced boldly in the face of a direct fire of artillery, and were only stopped by the bayonets of our Sepoys. But whilst doing justice to the fighting merits of this clan, it will not be forgotten that it was the Ghilzies who bore the principal share in the massacre of our helpless soldiers and followers on the fatal Caubul retreat. General Browne's column may expect to see much of the Ghilzies when he advances from Jellalabad, and they will form a most valuable support to the Ameer's regular troops, as operations draw our columns nearer to Caubul. General Roberts, too, will doubtless form their acquaintance should he ever approach the Surkai and Shuturgurdun Passes.

Joining the Ghilzie country to the south, we find certain Pushtoo-speaking tribes, which I imagine cannot be relied upon by the Ameer to take any prominent part in the general defence of Afghanistan, owing as they do but scanty allegiance to him. These clans would doubtless oppose an obstinate resistance if attacked in their own country. The tribes referred to are the Kākars, who are said to number from 14,000 to 20,000 fighting men; and the Tarins, whose fighting strength is said to be about 6,000 men. These might be expected to combine with their neighbours in resisting a British force, if to do so would not take them very far from their country. Any offensive operations undertaken by these three tribes will be, presumably, in the direction of the Bolan and Khojuk Passes, and on the onward march of General Biddulph's force to Candahar.

Turning now northwards to other Pushtoo-speaking tribes of Afghanistan, I would mention—though not strictly subjects of the Ameer's—those well-known tribes of the eastern end of the Safaid Koh mountains, the Afreedees, the Orukzyes, the Khyberries, &c., also two tribes, undoubted subjects of the Ameer's, the Turees and the Jajees in the Kurrum Valley. As far as events have yet declared themselves, none of these tribes except the last seem likely to join heartily against our invading columns, and the Ameer's defensive strength will be proportionately reduced. The Momunds, on the north bank of the Caubul river, and also subjects of the Ameer, appear from recent accounts to have deserted his cause, and, nominally at least, to have made their submission to General Browne. I think this list pretty well exhausts the Pushtoo-speaking races who compose the population of Afghanistan. The Bajowrees have never been his willing subjects, and are not likely to become such after our recent successes.

A bare enumeration of some of the Persian-speaking tribes must suffice. They are—

1. The Kizzilbashes, estimated by Major Lumsden at 30,000, and many of whom are found in the Ameer's regular cavalry and artillery.

2. The Tajiks, estimated by the same authority at 100,000, many of whom also serve in the Ameer's regular regiments. They are chiefly met with in the Caubul and Ghuznee districts, and being looked upon and treated by the Afghans as an inferior race, it is not likely that they will fight with any very great zeal in the Ameer's cause.

3. The Hazáras. These are only partially the subjects of the Ameer; the inhabitants of the interior of the Hazára Mountains being quite independent. The remaining classes which go to make up the total population of Afghanistan may remain unmentioned.

When we come to estimate the probable gross number of the Ameer's subjects, we are met with very serious difficulties, as must always be the case where the census is unknown, and statistics of the rudest kind. Lumsden, in 1858, estimated the total number of the Ameer's subjects at two-and-a-half millions, including one million for the population of Balkh, &c. According to the estimate of the Russian Central Staff Office, as lately given in the columns of the *Times*, the population of Afghanistan is six millions. It is open to us to choose between the two authorities, Major Lumsden and the Russian Staff; and I think there can be little doubt which is most likely to be correct. I may here remark that though the information which the Russians have recorded regarding Afghanistan is curious, and shows the interest they are taking in the concerns of that country, yet that a careful examination of what they have chosen to make public on the subject, shows that their information is very unreliable. It may be confidently said, I think, that the Russians do not know so much of Afghanistan now as we have known since the first years of the century through Mr. Elphinstone's wonderful book. Lumsden believes that his estimate of two-and-a-half millions is rather above than below the mark. Certainly it was made 20 years ago, but there has been nothing in the subsequent history of the country to make it probable that the population has increased in that time. In calculating the fighting strength of the Ghilzies he reckons it at one in every seven of the population. If this can be relied on for the other tribes, and if the whole population is what Lumsden supposes, two-and-a-half millions, Afghanistan would have a fighting strength of about 375,000. The character of the people, however, and the endless private feuds and clan jealousies which exist among them, make it extremely unlikely that the whole population would ever unite for a common object, and conclusions drawn merely from numbers in estimating the probabilities of a national resistance would be likely to be erroneous.

I now approach a branch of the subject which at present possesses peculiar interest. I mean the Ameer's military resources.

In 1857, Major Lumsden being resident at Candahar for some months at the head of the British Mission, was able to obtain very accurate information as to the then regular army of the Ameer. At that period the regular infantry consisted of 16 regiments, of a nominal strength of 800 men each, "as fine a body of men," says Lumsden, "in point of physical power, as any to be found in Asia, and "appearing at first sight capable of enduring great fatigue."

"But," continues Major Lumsden, "after seeing a good deal of "these men, I considerably doubt their power of endurance." These regiments, he tells us, are recruited by the forcible seizure of a certain number of able-bodied men from each district, who are compelled to serve, on pain of imprisonment, and the consequent utter ruin of their families.



The regular regiments were armed, in 1857, with the old flint musket and bayonet of the British army, or an imitation of them made at Caubul; a few companies having a similar imitation of the now obsolete 2-grooved rifle. The accoutrements were the refuse of the British magazines, and had evidently been picked up at auctions of condemned stores at Peshawur, and other frontier stations; or had been made at Caubul. The clothing was the cast-off uniforms of the British regiments, the officers of all grades in the same regiment being dressed in every variety of British habiliments, from the General's full dress, to the whipper-in's hunting coat! The pay of the infantry soldier was and probably is 5 rupees nominally a month; with, however, two months in each year deducted on account of clothing and necessities. The distribution of pay was most irregular, and a portion of it was always paid in grain, or by a remission of revenue made to the soldier's family. The natural result of this unsatisfactory mode of paying the men was that they were frequently left without the means of subsistence, and were driven, by sheer starvation, to subsist themselves by plunder and highway robbery, the proceeds of which were often shared by the officers.

The discipline was harsh in the extreme. Fines were constantly inflicted on the most trivial pretences. Sometimes the men were stripped, and beaten with sticks till insensible. "In short," says Major Lumsden, "the ill-treatment the men habitually receive is such, that only fear keeps them from mutiny, a crime visited by instant death, or other hardly less severe punishment."

The infantry regiments which came under the notice of Major Lumsden were indifferently drilled, and the officers possessed little knowledge of their duty. Target practice was entirely unknown, and the men were in consequence wretched shots.

The Ameer had, in 1857, three regiments of regular cavalry, a bad imitation of the old Indian regular cavalry (extinct since the Mutiny), to the extent even of copying their hussar saddles and steel scabbards. The appointments were of the same inferior class as in the infantry. The men were kept all through the summer at foot-drill, the horses being sent to a distance to graze. From the want of knowledge of their duties on the part of the officers, this arm was declared by Major Lumsden to be quite useless. By their shadow of discipline the men had lost the individual confidence, so requisite in irregular troops, without acquiring the collective confidence of regular cavalry.

The Ameer's artillery in 1857 consisted of 1 mortar, 3 heavy, and 76 field guns. The officers had no scientific, and very little practical, knowledge of gunnery. They knew for instance the composition of a fuse, and how to fill it, but were unable to cut one to the required length for a given distance. The men were clothed in our old artillery uniforms. Many of the guns were unserviceable and without ammunition. The equipment and carriages of many of the field guns was in the most inefficient condition.

The state of things above described was what a most competent person found twenty years ago under so able a ruler as Dost Mahomed. It would be rash to assert that things may not have altered for the

better since then. We know, indeed, for the matter of arms, that the Ameer has, within the last few years, received from us a battery of field guns, 10,000 Enfields, and 5,000 Sniders. The Enfields and Sniders would be enough to arm the whole of the infantry as it was in 1857. It is said that the regular infantry has been added to of late years. The Russian accounts, however, above referred to, and which seem to bear date about 1868, do not bear out this view, as they estimate the regular infantry at 10,000, or about the same as Lumsden. But whether such troops as Lumsden represents these to be have been increased or not, appears to me quite immaterial. The real question is whether their quality and discipline has been improved. I see nothing to show that they have; and if this be so, there is little to alarm us in having to fight any number of such regulars, than whom the armed peasantry of the country would be far more dangerous foes. The Ameer, however, has a far better and more formidable description of troops behind in his irregular infantry known as Jezzailchees, from the arm they carry. The following is Lumsden's account of them:—

“Besides his regular army, the Ameer has always available the Jezzailchees, which were formerly the only infantry in the country. They are tirailleurs, or light troops, armed with matchlock or jezzail, and accustomed to hill warfare, and are perhaps as good skirmishers as are to be found in Asia, being excellent judges of ground and distance. Instinct teaches them almost to scent an ambush, and it is a current remark in the country, that a good Jezzailchee on a hill-side will conceal his body behind his own grass sandals. The Jezzailchees are of two descriptions—those in Government pay on a nominal salary of 5 rupees a month (paid chiefly in grain), and armed by the State; and the Jezzailchees of the different chiefs, who generally have a piece of rent-free land assigned to them in lieu of pay. The Government Jezzailchees now (1857) number some 3,500 men.”

The numbers of the second description of Jezzailchees, namely those in the private employ of the different Sirdars, Major Lumsden professed himself unable to determine. He feels certain, however, that in no one place could 1,500 of them be got together for service; “for,” says he, “we must remember that an Afghan hates no one so sincerely as his nearest neighbour, if he be more powerful than himself; and that his love of country, or any other human tie, will always give place to his self-interest or love of revenge; so that a collection of the whole male population, for any length of time, for a given object, is simply impossible, although a considerable number might be got together to make a rush for the sake of plunder.”

Behind the regular cavalry, as behind the infantry, there is a far more formidable body of irregulars, which Lumsden estimates at 20,000. “These troops,” he says, “are equal to any undisciplined horsemen in Asia, mounted on small but wiry horses.” “They are rough and ready soldiers, capable of undergoing great fatigue, terrible to a flying foe, good hands at feeling for an enemy, or foraging; and when led by a determined chief, anything but contemptible in a *mêlée*.”

Shere Ali is said, I believe, to have at the present moment a standing army of 80,000 men, including the Jezzailchees. If this really be so, which I am inclined to greatly doubt, and unless Major Lumsden was grossly misinformed as to the strength of the standing army in 1857, the inference would be that within the last few years Shere Ali has been able at least to quadruple his military force, and of course the cost of maintaining it. Is this credible? Is there any reason to suppose that the financial condition of Afghanistan has improved so much in the last few years as to make such a vastly-increased military expenditure possible? I therefore take leave to doubt very strongly if Shere Ali has anything like the organized force which report says. But if he has, or at least, if much of this extraordinary increase has occurred in his regular troops, I can only say, so much the better for us. It would be little short of miraculous if the half-starved, mutinous, and ill-treated regulars whom Lumsden saw twenty years ago, should have grown, during that time, into a force capable of contending on equal terms with even the British Sepoy of the present day, let alone the British soldier with his admirable arm of precision. As easily can the leopard change his spots as the Afghan his habits. The starved and cheated regulars whom Lumsden saw in 1857 are, we may rely upon it, equally starved and cheated in 1878. The more, then, of this kind of soldier Shere Ali can put into the field, the better: of all bad troops, ill-disciplined regulars are the worst, and unless the experience of the first Afghan war is to be altogether belied, neither regular nor Jezzailchee, still less the armed peasantry of the country, will stand for a moment before such troops as are now arrayed on Afghan soil, under Generals Browne, Roberts, and Biddulph.

My lecture has already extended to a length which I fear must have wearied many of you. But the field is so large, and so much of the subject still remains untouched, that I can only hope that on some future occasion what is now perforce left unsaid may find expression from another lecturer.

Only the veriest outworks of the subject of "Afghanistan and the military operations therein" have been approached by me; and I feel very like an impostor when I think how little impression has been made in the real defences. I conclude with the following pregnant words of Major Lumsden, written, it is true, twenty years ago, but which it is impossible to doubt are equally true now:—

"As might be expected from the needy and tyrannical disposition of the Ameer's sons, at a distance from his control, quiet and industrious communities are ground to the dust, and their rich and once cultivated lands fast turning to wilderness; while more turbulent races hold their own by sheer force; mercantile classes are ruinously and arbitrarily taxed, and citizens, under the cloak of municipal legislation, are fleeced of their substance without gaining security in their homes, but on the contrary their houses are frequently robbed, and families dishonoured by a licentious soldiery, constantly on the verge of mutiny, and let loose on the community to make up the arrears of their own pay so unjustly withheld from them."



APPENDIX.<sup>1</sup>

The northernmost or Khyber Division numbers about 8,000 men, with 42 guns; the Central or Kurrum Field Force, about 4,500 men, with 24 guns; the Southern or Quetta Division, 4,000 men, with 18 guns.

## KHYBER EXPEDITIONARY FORCE.

Lieutenant-General Sir S. J. Browne, K.C.S.I., V.C., C.B., commanding; Quarter-master-General Colonel C. M. Macgregor, C.S.I., C.I.E.

Commanding Royal Artillery, Colonel E. Williams, C.B.; commanding Royal Engineers, Colonel F. Maunsell.

Cavalry Brigade.—Colonel C. Gough, V.C.; 10th Hussars, Lieutenant-Colonel Lord Ralph Kerr; Guides Cavalry, Major G. Stewart; 11th Bengal Lancers, Major Boyle; one battery Royal Horse Artillery.

1st Infantry Brigade.—Colonel H. Macpherson, V.C., C.B., Brigade-Major D. Macpherson, B. S. Corps; 4th Battalion Rifle Brigade, Lieutenant-Colonel Newdigate; 4th Goorkhas, Lieutenant-Colonel J. P. Turton; 20th Punjab Infantry, Lieutenant-Colonel Rogers; one company Sappers and Miners; Hazara Mountain Battery.

2nd Infantry Brigade.—Colonel Tytler, V.C., C.B., B. S. Corps; 1st Battalion 17th Foot, Lieutenant-Colonel Dalrymple Thompson; Guides Infantry, Lieutenant-Colonel F. Jenkins; 1st Sikhs, Major A. G. Ross; one company Sappers and Miners; one battery R.H.A.

3rd Infantry Brigade.—Colonel Appleyard, 85th Light Infantry; 81st Foot, Colonel Chichester; 14th Sikhs, Lieutenant-Colonel Williams; 27th Punjab Infantry, Major Birch; one company Sappers and Miners; one battery Field Battery.

4th Infantry Brigade.—Brigadier-General C. C. Ross, C.B.; 51st Light Infantry, Lieutenant-Colonel Acton; 6th Native Light Infantry, Colonel Thompson; 45th Sikhs, Lieutenant-Colonel Armstrong; one Company Sappers and Miners; one battery Field Battery.

The Artillery force attached to Sir Samuel Browne's Division comprises the following batteries:—

I Battery A Brigade R.H.A., Major Tupper; D Battery A Brigade R.H.A., Major P. Hill; H Battery C Brigade R.H.A., Major C. Nairne; C Battery 3rd Brigade R.A., Major Magenis; C Battery 4th Brigade R.A., Major Auchinlech; D Battery 4th Brigade R.A., Major Davidson; Hazara Mountain Battery, Captain de Latour.

## KURRUM FIELD FORCE.

Major-General F. S. Roberts, R.A., V.C., C.B., commanding; A.D.C. Captain Lord W. Beresford, 9th Lancers; Assistants Adjutant-General, Major W. Galbraith, 85th Light Infantry, and Captain J. Davidson, B. S. Corps; Assistant Quarter-master-General, Major H. Collett, B. S. Corps.

Cavalry Brigade.—Colonel H. Gough, V.C., C.B., one squadron 10th Hussars; 5th Punjab Cavalry, Major B. Williams, commanding; 12th Bengal Cavalry, Colonel P. S. Yorke.

1st Infantry Brigade.—Colonel Cobbe, 17th Foot, commanding; D.A.Q.M.G. Captain Kennedy, B. S. Corps; Brigade-Major, Captain A. Scott, V.C., 4th Sikhs; 2nd Battalion 8th Foot, Lieutenant-Colonel Drew; 5th Punjab Infantry, Major M'Queen; 29th Punjab Infantry, Colonel J. J. H. Gordon.

2nd Infantry Brigade.—Colonel Thelwall, C.B., B. S. Corps; D.A.Q.M.G., Captain F. Carr, 5th Punjab Cavalry; Brigade-Major, Captain G. de C. Morton, 6th Foot; 72nd Highlanders, Lieutenant-Colonel F. Brownlow; 2nd Punjab Infantry, Major

<sup>1</sup> From the *Times* of 22nd November, 1878.

Tyndall; 5th Goorkhas, Major FitzHugh; 21st Punjab Infantry, Lieutenant-Colonel J. M. Stewart.

The following Batteries are attached to this force:—

F Battery A Brigade, R.H.A., Major W. Stirling; G Battery 3rd Brigade, R.A., Major Blackwood; 11th Battery 9th Brigade R.A., Major E. Dyce; Peshawur Mountain Battery, Captain Charles; Lieutenant-Colonel A. H. Lindsay commands the Artillery of this column.

#### QUETTA EXPEDITIONARY FORCE.

Major-General A. S. Biddulph, R.A., C.B., commanding; Assistant Adjutant-General, Major G. B. Wolseley, 65th Foot; Assistant Quartermaster-General, Colonel H. Moore, C.I.E.; D.A.A.G., Captain R. Stewart; D.A.Q.M.G., Captain H. B. Hanna; Commanding Royal Engineers, Lieutenant-Colonel W. Hichens; Commanding Artillery, Lieutenant-Colonel C. B. Le Mesurier.

Cavalry Brigade.—Colonel Palliser, C.B.; 1st Punjab Cavalry, Major M'Lean; 2nd Punjab Cavalry, Colonel T. G. Kennedy; 3rd Scinde Horse, Lieutenant-Colonel Malcolmsen.

Artillery Brigade.—E Battery 4th Brigade, Royal Artillery, Major Martells; No. 1 Punjab Mountain Battery, Captain Kelso; No. 2 Punjab Mountain Battery, Captain Swinley; Scinde Mountain Battery, Captain H. G. Young.

1st Infantry Brigade, Colonel Lacy, commanding.—70th Foot, Colonel Pigott; 1st Punjab Infantry, Major F. J. Keen; 19th Punjab Infantry, Colonel E. B. Clay; 26th Punjab Infantry, Lieutenant-Colonel M. G. Smith; 32nd Punjab Pioneers, Colonel Morgan; 29th Bombay Infantry, Lieutenant-Colonel Nichollets; 30th Bombay Infantry, Colonel Mainwaring.

The CHAIRMAN: Before making any remarks on the paper myself, I will invite any gentleman who is acquainted with the subject to open a discussion on it. The only suggestion I have to make is, that political matters may be put on one side. We are confined here to military topics, and I am sure there is quite sufficient material in the very interesting and important paper which has been read, to give rise to a discussion, without trenching at all on forbidden ground.

General FYERS: I may state that I was present in Afghanistan with General Nott in 1841, and my object in rising is to ascertain from yourself, Sir, and others, on what grounds the frontier is to be stopped at Jellalabad. If we are to draw our line through the Jellalabad valley, it seems to me a very grave mistake will be made. We must remember that that frontier will not remain simply as a frontier between ourselves and Afghanistan, but it will be the frontier (and we must take that view of it from this time) between ourselves and Russia. I cannot express to you my extreme anxiety on this point of the frontier; and I think all military men will agree with me, that when we have the power of drawing a frontier to please ourselves, that frontier ought to be in every respect a substantial frontier. Now the fact is, that Jellalabad can be turned in a great number of places and points. In taking up your most forward position at Jellalabad in that particular pass towards Cabul, you can be turned at a great number of points.

The CHAIRMAN: Permit me to mention that the subject that you are discussing, although of very great interest, is to form the particular subject of a lecture, which General Hamley will give on "The strategical condition of our Indian north-west frontier," the observations therefore that you are now making will be more appropriate on that occasion.

General FYERS: I was not aware that this important question was to be made the subject of a separate lecture.<sup>1</sup>

<sup>1</sup> NOTE.—With regard to our position at Jellalabad being turned—what I mean by the expression *turned* is, that you could be easily invested and your entire communications severed from many points, unless you hold the surrounding mountain districts in force, and also possess the loyal and thorough co-operation of the tribes adjacent to

Lord WAVENEY: With the permission of the meeting I will offer a few observations on the general question. The point that has most struck my attention in the lecture is the reference that has been made to the probable strategy which has dictated the advance of General Roberts, namely, the moral considerations that are to be derived from it, and the support that is to be given to the operating columns on either flank by the position that he may have to occupy, although he may never pass the Shuterghardan Pass. That observation is ingenious, and well worth our consideration. With regard to the establishment of the frontier, I was very much interested, and I have no doubt Officers present will have read with attention a translation from the report of a German Officer in regard to the position of British India and particularly as to points of defence on our north-western frontier. He summarizes the whole in a manner which gives us the point on which the problem should, in my idea, be worked out. He speaks of the north-western

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these passes. Now it appears to me that the only way of saving the occupation of Jellalabad from the charge of being a mistake is, by regarding it as a central position for that attraction which would unfailingly result from a wise and conciliatory policy set in action among the chiefs and the different tribes or clans from thence. It is argued by Officers of great experience, that the Afghan tribes are such wild, rapacious, and untameable men, that any and every attempt to get at them with the thin end of civilization would be certain to fail; looking, however, to the success which has crowned the efforts made by our countrymen in other parts of the world, and notably in Canada, in South Africa, in New Zealand, I cannot but feel a confident assurance that the same description of wise and patient conciliatory treatment of the Afghan tribes over whom we could now bring to bear this benign protection, would in time be rewarded by a loyal and very thorough attachment on their part. I have it much at heart, therefore, that should we for military reasons deem it wise to take and occupy the Jellalabad Valley, the chiefs of all the neighbouring tribes should be invited to assemble at Jellalabad, there to meet a Commissioner appointed for the duty, who should lay before them a well-considered plan of forming a confederacy which should regard the British Government as their protector; that this confederacy should also have its annual meeting or assembly of chiefs at Jellalabad under the presidency of the Commissioner, to decide upon all matters affecting their own interests and affairs generally.

I am impressed with the belief that, by a truly liberal and generous treatment of these tribes, and by giving them every aid in the improvement of their land, by the encouragement of productions for which their valleys are presumably capable, and by the gradual growth of commercial relations with India, you would establish such a condition of things as would form your most reliable protection against any action of an enemy, whether that action took the form of intrigue or more openly of armed interference. I must say I prefer to take this view of our duties towards those tribes; for, under any circumstances, I would sooner thus reclaim our neighbours than be always under the painful necessity of regarding them as impracticable, irreclaimable savages.

I consider that unless we do decide on acting in this way towards these tribes, we are going too far in going to Jellalabad, or not far enough. The true strategical line, however, of either attack or defence of Afghanistan is by Candahar. On the broad ground of acting thoroughly in such a matter, I am of opinion that as much of the valleys which belong to the watershed of the Indus to the south of Kafiristan and the Sufaed Koh Mountains, and as far south as the Pisheen Valley, should be in this manner and in this spirit brought under our protection; I also consider it desirable that an understanding should be come to with the Ameer about a British garrison for Herat and for its more perfect fortification; but this is a matter of higher and more general policy, which it would be premature to speak of at present. All I will now say about this is, that henceforth Afghanistan must be regarded as one of the protected States of our Indian Empire; and this being so, it necessarily becomes of urgent necessity that at the conclusion of this war the new aspect of affairs should be thoroughly recognized, and that *all* needful steps for the security of the country should be taken in concert with the Ameer.



frontier of India as being a fortress of which the glacis is not in possession of the garrison. It appears to me a most accurate and clear illustration of the point at issue, and of the responsibility that awaits upon those who determine on whether the garrison shall be in possession of the glacis or not. And this leads me to another point, for if the whole object of war be merely to make war, and military success alone, or even political success, is to be the sole result of our occupation, a great portion of the advantage to be derived from our military success will, I fear, be lost or kept in abeyance. It is well for England, when she stands on the old paths and follows out the course by which she has consolidated her empire; as I have said on a former occasion, if war does not lead, not only to the development of our civilization and the consolidation of our frontier, but also to that of our material interest, then, indeed, war, though it has attained a portion of the advantages for which it was waged, has not obtained all. From the factory comes the fortress; the factories made the three great Presidencies of India; and when I say factories, I mean those centres of British commerce and industry, which should arise on the track of and follow our troops' victorious advance. I believe that the result of these movements would be to reopen to us the markets of Central Asia, from which we have been thrust back, partly by the skill of our Russian rivals, but also partly by that neglect, born of too great security, that has prevented us from sending goods as valuable as we should into the markets which the Russians have occupied. And I turn here to a quotation that I made from one of the most remarkable works on the interior of Russia in her aggressive and advancing qualities. I speak of the works of that great traveller Atkinson, and the account he gives of the Amoor and Upper Siberia, especially on the frontier that the Russians now occupy. He speaks of the commerce carried on in the markets of Kokand, in the Khanates, and generally throughout that portion of Asia which we have lost as a field for our trade. My belief is, that with returning peace we shall have the opportunity, or at all events ought to have, of recovering these peaceful conquests. Then, again, with regard to the means by which these are to be maintained, I have acquired in this excellent lecture information which was perfectly new to me until this day, of the success of that merchant class who force their way yearly through the fiercest of mountain tribes of the Gomul Pass, not as armed men, but carrying merely their packs, with the burden of their goods, their women and children. Now if we are to form our frontier on the glacis or external slopes of the hill region, and if we are to occupy the Gomul Pass, then I say, place the Gomul Pass in the charge of these soldier merchants, and they will keep the passes open under all circumstances. I have to apologize for these suggestions, but they have occurred to me lately very forcibly.

SIR MORDAUNT WELLS: I wish to observe on a point likely to be very much discussed, namely, the bearing of this question in reference to the independent hill tribes. In the year 1863 I had the advantage of crossing the Eusufye valley and visiting the forces during the time military operations were going on at Umbeyla, and I afterwards visited the frontier extending from Peshawur to Scinde. What impressed me the most was the remarkable loyalty and well-being of the dependent tribes formerly hostile to the British Government; and when the question is considered in reference to a rectification of the frontier, no difficulty whatever will arise in reference to the independent tribes. I think a just government of these tribes will bring them into the same condition as the dependent tribes now under our jurisdiction in the trans-Indus territory; and if we have been able to secure the loyalty of those tribes, mustering many thousands from one end of the frontier to the other, we shall have little or no difficulty in dealing with the independent tribes. I have heard it observed by those who are not acquainted with the country, that the consequence of attempting a rectification of the frontier will not only make the Ameer hostile to us, but that the independent tribes will be extremely sensitive if we occupy any portion of their territory. Having had the opportunity of communicating with many of the distinguished leading frontier Officers of the Punjaub, I am satisfied that by a bold and just policy similar to that we have carried out since the annexation of the Punjaub, we shall be able to exercise the same power over the independent tribes, and when that is achieved it will be for military men to determine, in a scientific point of view, the best line for the new frontier. I make these

few observations because I think it is not generally understood that in reference to these independent tribes all along the frontier, we shall be able to deal with them in such a way as to prevent any difficulty whatever in the extension of the frontier.

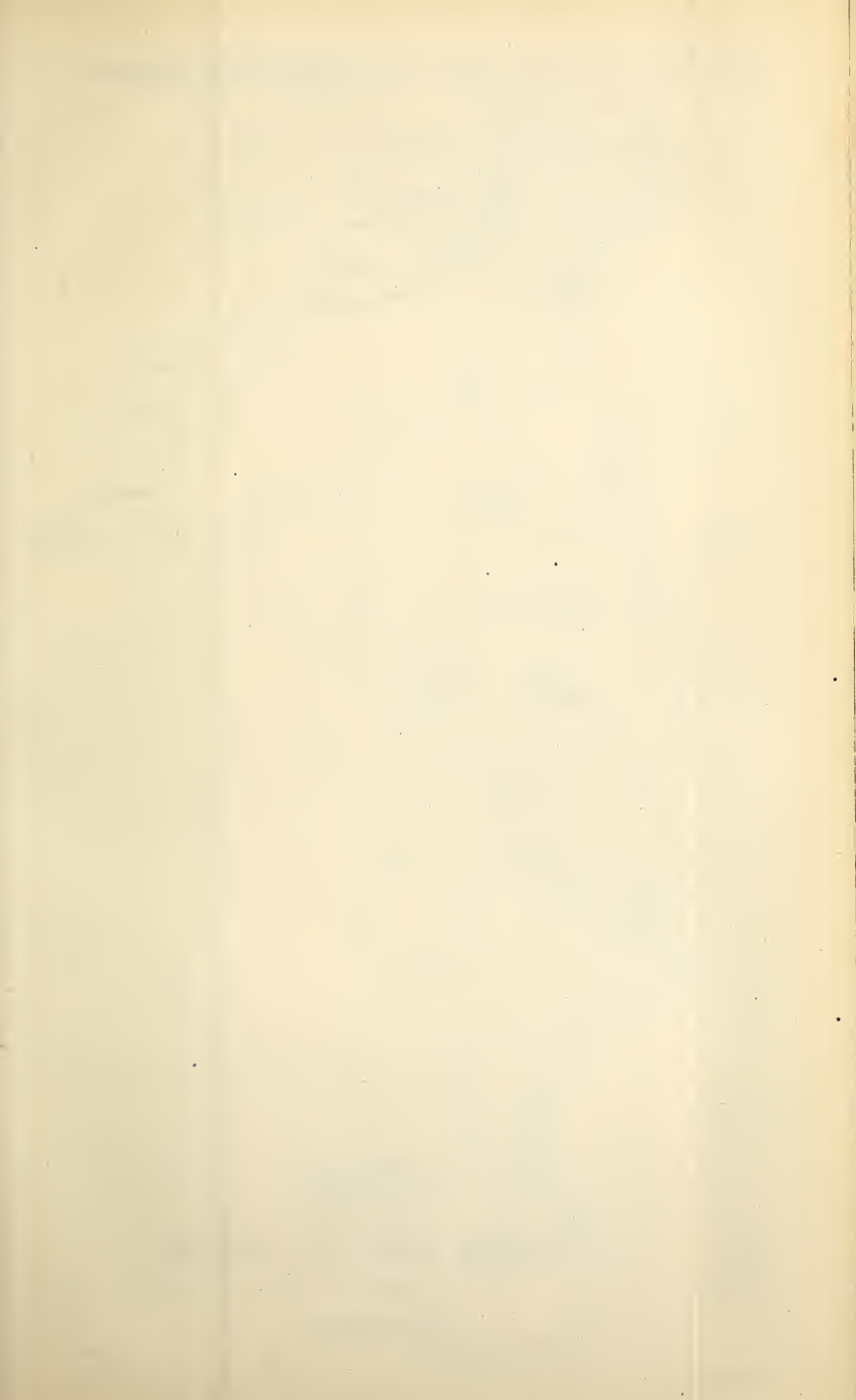
Colonel MALLESON: I should like to refer for a moment to the remarks which have fallen from Sir Mordaunt Wells. I quite concur with him in the statement he has made, that the tribes by judicious and careful treatment will become, I will not say as attached, but as much instruments in the hands of the British power, as any of the other natives of India. It is an historical fact of very great interest that the tribes of the passes have never been subdued. At the time when the Mogul Empire was in its palmiest days, when it was ruled over by the greatest man of the Mogul race, the Emperor Akbar, he who had conquered every enemy to whom he was opposed, who had never been defeated in a pitched battle, brought the whole strength of the Empire and combined with it the strength of the outlying frontiers of Cabul, the outlying passes of the country which the noble Lord has very happily called the "glacis" of Hindostan; he brought that united strength to bear on the tribes of the passes only to suffer defeat. The tribes of the passes remained independent during the whole reign of Akbar, and during the reign of his successors. In vain were attempts made to reduce them; they always held their independence; and this state of things was finally terminated by the Mogul Sovereign granting them an annual subsidy. Things were in that state when the celebrated adventurer called Nadir Shah rose into power. Nadir Shah conquered the whole of Persia and a portion of the southern part of that which is now Russia, and was the head of the whole of the tribes of Central Asia. Leading an army of 100,000 men he tried to traverse the passes into India, but Nadir Shah, who had conquered the whole of Asia, was baffled by the tribes. He refused to pay the tribute they demanded, and for a whole month the tribes of the Khyber Pass baffled his Army. It ended by his agreeing to the terms they proposed to him, which were to continue to them the subsidy which the Moguls had granted before. On the fall of Nadir Shah arose the present kingdom of the Douranees. The Douranees pursued the same course as Nadir Shah, and it was by subsidising the tribes that the passes of India were opened to them. That course was followed until 1841. In 1841 Shah Sujah was the nominal sovereign of Afghanistan. The Government of Shah Sujah was virtually swayed by the British Envoy, and by a misjudged measure of economy it was decided in 1840 to cut down almost one-half the subsidies given to the mountain tribes. It was only yesterday I was reading the account of the result of that attempt at economy. The chiefs of the tribes left the presence of the Envoy promising everything. Within a week from that time, every pass leading from Cabul to the British frontier was stopped, and it was very much in consequence of that ill-judged measure of economy that the calamity of 1841 came to maturity in Cabul. I therefore entirely echo the hope that has been uttered by my learned friend, that whatever may be our policy in the future we shall see the wisdom of coming to such an understanding with the tribes of the passes as will render them true and loyal to the British Government.

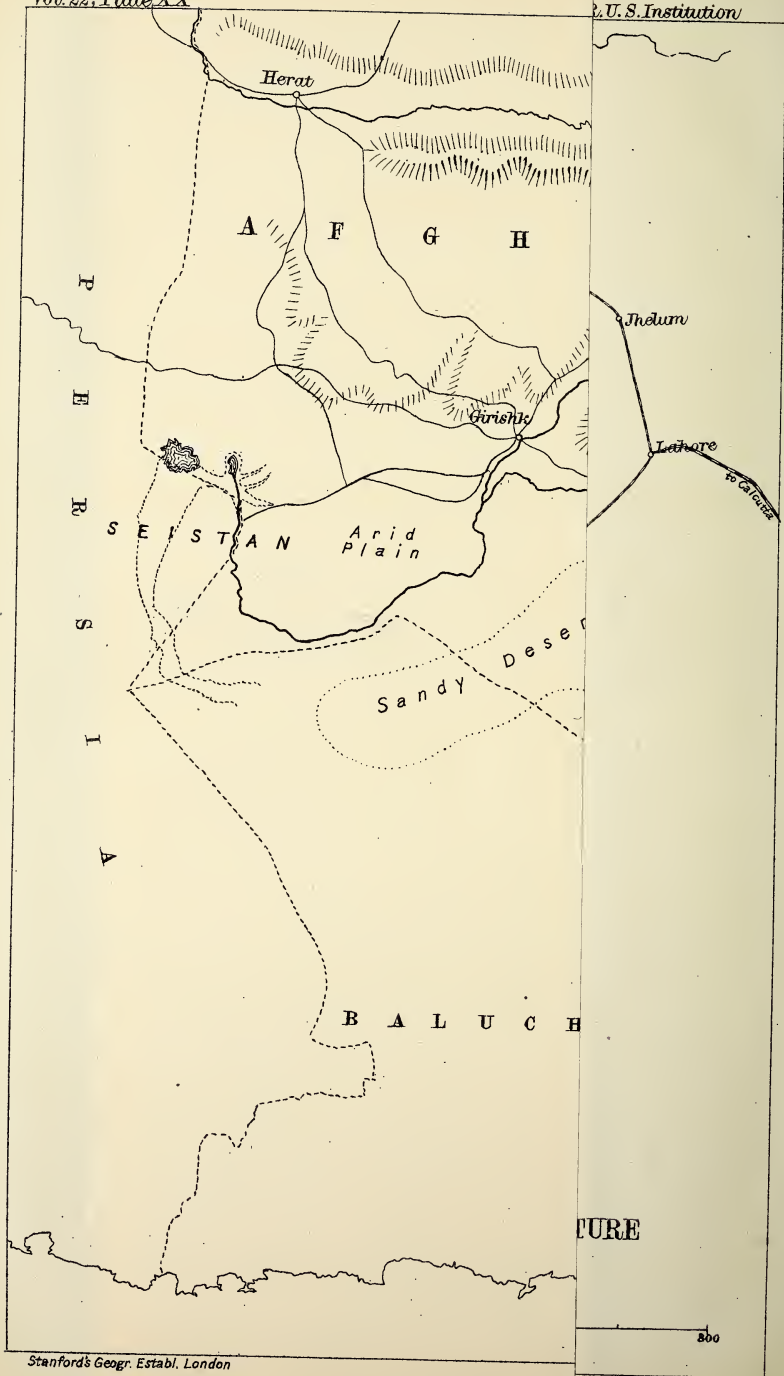
The CHAIRMAN: Perhaps you will allow me to say a few words before the meeting breaks up. I have no intention to follow the very interesting paper that has been read to us in any detail. I will only say that I agree, so far as my own experience and opinions go, generally with the tenor of it throughout. It seems to me a very temperate and well-considered digest of the present military aspect of the question. I think it is highly creditable to General Vaughan's judgment and foresight that he should have pointed attention to the exact operations by which our two first successes have been actually achieved. I allude to his having pointed out, in anticipation of what has taken place at Ali Musjid and the Peiwar, that a turning movement was an essential operation in Afghan warfare. Although individually brave, the Afghans lose heart immediately that they find there is an enemy in their rear; and as we have already seen, both in the case of Ali Musjid and the Peiwar, they become demoralized and fly before the advancing forces. This question of frontier undoubtedly is one of very great importance, and in the present stage of proceedings is one, moreover of considerable complexity; for we are unable to understand—at least I am unable to understand—how an advance at three different isolated points into a vast country like Afghanistan—that is an advance

by the Khyber Pass, by the Koorum Pass, and by the Bholan Pass—can be held to form a frontier. They certainly do not constitute a frontier of themselves; the most that can be said of them is that they form a series of advanced posts, upon which a frontier may be subsequently arranged. The question is one of very great interest, and I should trust that General Hamley, who is to address you at the next meeting, will turn his particular attention to it. There are several minor points in General Vaughan's paper, on which I might say a few words, but they are quite of secondary interest. You will remember, for instance, that he divides the Afghan nation into what he calls Afghans and pseudo-Afghans; but the real fact is the people who speak Pushtoo are the only true Afghans in the country; the rest of the population have no more claim to be called Afghans than they have to be called Russians. The real composition of the inhabitants of Afghanistan is as follows: there are two millions of Afghans and two millions of non-Afghans. The latter, who speak the Persian language, or dialects of the Persian language, being naturally favourable to any invading party, because in their normal state they are oppressed by the Afghans, and are thus always looking out for relief from the outside. During our former occupation of the country, all the non-Afghan population was decidedly in our favour. It is so at present and always will be, the true Afghans being the only portion of the population we can have against us. The component numbers of the population are about two millions of true Afghans, two millions of non-Afghans, and one million of strangers, including Turks, Persians, Indians, Beloochees, and several scattered outlying tribes. With regard to the Ameer's actual force, I am afraid that it is larger than General Vaughan has given him credit for. During the last few years, indeed, we have not positive information, but information which appears to be credible, that there has been a very large augmentation of what is called the organized regular force. Whether the force now really amounts to sixty regiments, as is reputed, I cannot say; but all the Officers and intelligent people who have recently come down from Cabul agree in that estimate. And when I say "Officers," I mean the native Officers of our Army, who have a very fair military knowledge, and employés also of our own regular establishments, native doctors, and people of that description, men of education and intelligence, who all describe the actual military forces at and about Cabul as between fifty and sixty regiments. But I quite agree with General Vaughan that the more Shere Ali wastes his strength in forming such regular regiments, instead of relying, as Dost Mahommed did, upon irregular levies, the more certain will be our success. The Afghans indeed are very formidable as irregular troops in holding passes and strong positions. They are exceedingly active, individually brave, and thus give immense trouble to regular troops who desire to dislodge them from their "*sangars*" and strong positions behind rocks and on the hillsides; but if you bring those people down into the plains and mass them in bodies under what they call discipline, but which is really no discipline, that is actually delivering them into the hands of the enemy. It is quite impossible that the so-called Afghan regiments can oppose any effectual resistance to our highly disciplined regular troops, supported with the artillery which we now possess, and bearing arms of precision. When I remember the Afghan fighting, forty years ago, the hill men had us at an advantage, as our old "Brown Bess," the smooth-bore musket, would not reach half the distance of their jezzails; and when a party, therefore, took possession of an overhanging precipice to fire upon the troops approaching, we were unable to reply with any effect, and it was a very serious and difficult business to dislodge them. At the present day we know that our arms of precision are superior to their weapons, and they know their inferiority as well as we do, which alone will be found, I expect, to dishearten them even more than their general want of discipline. Hitherto, indeed, they have had the greatest confidence in their jezzails, and I feel sure that once that confidence is gone, they will prove to be of no importance as soldiers, not even as irregular soldiers. I could have wished that some of the gentlemen who are here present, and who know the Afghan so well—for I see many Officers before me who have been on the frontier, and are well acquainted with the country—had given us a little of their practical experience. I myself in those days was a political, and not a military Officer, although whenever I had an opportunity I followed my General to the field as his aide-de-camp, and took my share in any fighting that was going on. I hope it will be understood that I do not pretend



to speak on an occasion like this, before so many experienced Officers, as a military man. I speak simply as one who was engaged in the old Afghan War, and who has attentively followed the progress of affairs beyond the Indian frontier, from that time to the present. And perhaps I may be allowed to say in conclusion that I do feel some sort of satisfaction in knowing that I have for so many years done my best to draw the attention of the Government and the country to the dangerous state of frontier affairs, and that I have always advocated the course which is now being followed. I have no doubt the result will be alike conclusive to the safety of India, honourable to the Army, and for the advantage of our national interests.







## LECTURE.

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Friday, December 13th, 1878.

MAJOR-GENERAL SIR HENRY C. RAWLINSON, K.C.B., F.R.S.,  
&c., &c., in the Chair.

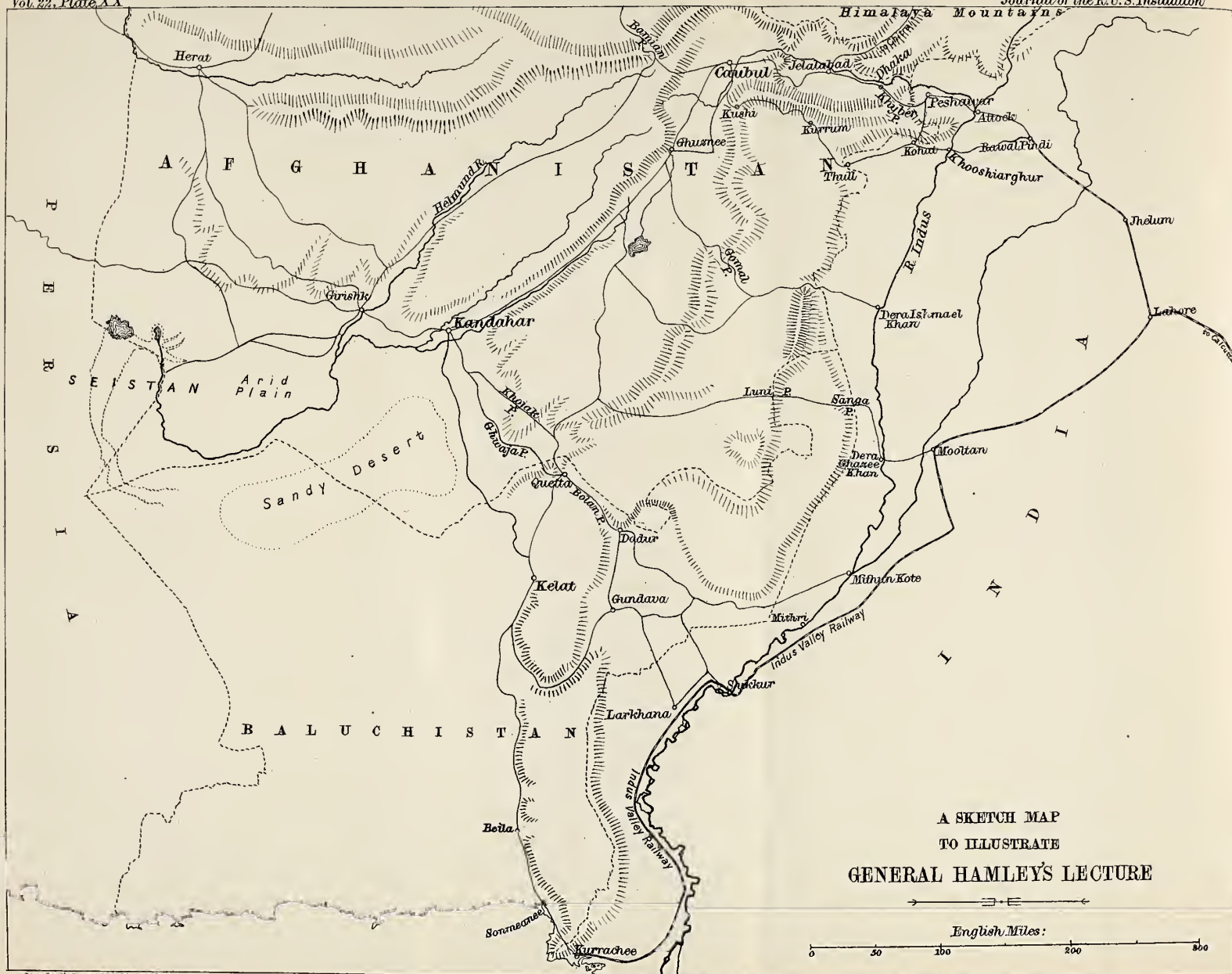
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### THE STRATEGICAL CONDITIONS OF OUR INDIAN NORTH- WEST FRONTIER.

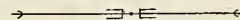
By Major-General E. B. HAMLEY, C.B., R.A.

I APPEAR here, in compliance with the desire of the Committee, to offer some remarks on our Indian frontier. I should not have ventured to volunteer to do so, and I do it, I will not say with reluctance, for I am happy to comply with any wish of the Committee, but certainly not without misgiving, feeling that among you there are certainly some, perhaps many, Indian officials of the highest distinction. But I am encouraged by the thought that a personal acquaintance with a territory is not indispensable to the formation of strategical opinions about it—if it were, the majority of the most famous campaigns would never have been planned. I am encouraged, too, by feeling how little aid the subject requires from me to render it interesting—never has the interest it has excited been so strong as now, though for nearly thirty years it has been warmly discussed by the best minds in India. These still contest each other's conclusions, from widely divergent points of view, and I may therefore perhaps consider it a point in my favour that I have approached the subject without bias, as I would any other strategical problem, desirous only of arriving at a right conclusion, and uninfluenced by the weight of opinion on the one side or the other.

First, let us look to the Indus—often spoken of as the natural frontier of India. To be a good line of defence a river, besides being difficult to cross, should have protected bridges in the possession of the defender, connected by good communications on the defender's bank, and that bank should, at important points, command the other. The Indus is unbridged by any permanent structure. In its upper half it is a swift, even turbulent, stream flowing mostly in a deep rocky bed—from 100 to 400 yards wide—in its lower, though still swift, it flows between flat banks and frequently changes its channel—insomuch that the bridge of one year might be left on dry ground



A SKETCH MAP  
TO ILLUSTRATE  
GENERAL HAMLEY'S LECTURE



English Miles:

0 50 100 150 200 250

## LECTURE.

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the next. When the snows melt the river rises and spreads widely over its banks—thus bridges would at times be swept away or submerged, and roads along the bank would be useless. There is a bridge of boats at Attock which has been frequently carried away, and another was thrown two years ago at Khooshalghur. Nevertheless, I believe that permanent bridges might be thrown—it is merely a question of expense. The left bank is flat throughout and is frequently commanded by the right. These are circumstances to be taken into account when we are told that the Indus is the proper frontier of India.

Beyond the river, at an average distance of some fifty miles, runs the frontier line, which let us define for the present purpose as limited on the right by a point opposite the Khyber, on the left by one opposite the Bolan. The distance measured along the river in rear of this line from Attock to Sukkur is about 500 miles, the frontier line of course being considerably longer. This frontier runs for great part of its length along the foot of a mountain range, penetrated between the Bolan and the Khyber only by a few difficult passes. Now of all barriers, that which gives most security, next perhaps to a great desert, is a range of this kind, and hence a few thousand men to prevent the depredations of the hill tribes, suffice to protect an extent of frontier which, were it of a different kind, with a powerful neighbour on the other side, would demand, in case of a formidable war, vast armies, and even in peace very considerable forces, for its defence. There are several passes between the two I have named, but besides the Khyber, it will only be necessary to speak of two in this part of the frontier, the Kurrum, issuing in our territory at Thull and Kohat, and the Gomal, issuing opposite Dera Ismail Khan. Others exist—there is one that issues in the bed of the Kurrum river near Thull—but besides that we know little of them, except that they are exceedingly difficult, there is another reason why I should not occupy any time in describing any south of the Gomal.

There will be no dispute that the Khyber is, of these three, the fittest for the passage of a column of all arms. It is much the shortest, the easiest, the best supplied with water, and connects directly the most important points, namely, the city of Caubul with a favourable place for bridging the Indus at Attock, whence, by the great road, to Lahore, and thence into the valley of the Ganges.

Of the Kurrum we have learnt a good deal. It is easy of passage all the way from the Indus to the Paiwar Pass, but from thence to the point where it joins the hill road between Caubul and Ghuznee, at Kushi, it is of exceeding difficulty, impassable for any kind of vehicle, and rendering the supply of even a lightly equipped column an arduous task. Whether General Roberts had at first any vehicles in his train I do not know. It is to be inferred that he had not, from the fact that his light guns were carried on mules, his heavier artillery on the backs of elephants—however this may be, we may be certain he has none now. The issue of this pass in our territory at Thull is 100 miles from that of the Khyber. A column so strong and well equipped as to be independent could not pass here; one that

could not act independently would scarcely venture; and it is not likely, therefore, that any serious attack will be made by way of the Kurrum, or of that other pass which issues near it.

The Gomal, from Ghuznee, does not present the insuperable difficulties of the Kurrum, and could be made practicable, though not easy, for a column of all arms; at the best it would still present much steep broken extent of track, and many narrow passes. It is very circuitous, and about a third longer than the Khyber, from which it is distant 200 miles.

In forming an idea of a march in force through such passes, it may assist us to remember that an English Army Corps, say 24,000 strong with artillery, extends with its combatant forces only, on a European road about 16 miles in length, and with its trains 27 miles. Allowing only a slight increase for the nature of the road, the combatants of a similar force in the pass would stretch 18 miles, the total with trains 30. Thus, when the head of the combatant column issued from the pass, its rear would be nearly two days' march behind; and considering the host of animals required for the necessary supplies on such an expedition, the rear of the trains could then scarcely be less than six days behind the head of the column, that is to say, only about two marches beyond Jellalabad.

Accustomed as we are to see the mountain chains of Europe successfully passed by great armies, we must be careful to remember how different in depth are those ranges from the hills of Afghanistan. In a couple of marches the Prussian armies were through the Bohemian mountains, and presently combined in the attack at Sadowa. But here, the shortest pass through the barrier, that between Caubul and the Indus Valley, is 190 miles long—the Gomal nearly 300 miles—and not days but weeks are occupied in the isolated march.

Now, when we remember what an invading army of India implies—that it shall bear with it the means of passing the Indus—that it shall be prepared to encounter the forces of our Indian Empire—and that, thus formidable in numbers and equipment, it must rely for supplies on the path through which it has issued, we shall form some idea of the difficulties which would encompass an army in its attempt to enter India by these routes; and these difficulties I will ask you to bear in mind when I recur to this part of the subject. Let us next see what conditions another part of the theatre may present. But first let me pause to say what I understand by an invading army. Not all the assembled forces of the Afghans—not such a Russian force as we saw lately assembling on the frontier of Bokhara—not such an army as Persia can at present send forth—any or all of these would fall far short of the requirements of such an enterprise. But I will suppose that Russia has completed those improvements in her communications which we know she persistently contemplates; that she has united the Caspian and the Aral by a railway; or that, combining with Persia, she has made a convenient way from the southern shore of the Caspian to Herat; that the ruler of Afghanistan has thrown in his lot with them; and that within the fortified triangle Herat, Kandahar, Caubul, the dispositions for this great undertaking have been brought

deliberately, with all the aids of military science, to completion. We may be assured that an invading army of India, such as we cannot afford to despise, will be no improvised force, no barbarous horde, but truly formidable in numbers, organization, and leadership. And I will further assume for the moment that, as has been so often recommended, we await the attack in the valley of the Indus.

From Caubul the confederated forces of the enemy, posted as I have suggested, will threaten an advance through the western passes; from Kandahar they will threaten an advance through the Bolan. Let us follow the movements of what we may call the enemy's Army of the Bolan, assembled about Kandahar. As it moves south it will find the character of the country very different from that of the mountain districts of the north. The hills are no longer of impenetrable aspect; manœuvring ground exists almost everywhere; a great part of the country consists of extensive plains; and though there are a few passes, formidable if held, yet they are by no means such obstacles as those of the Suleiman range. Over one of these, the Khojak, the road passes to Quetta. From thence the main road, and that chiefly used by caravans travelling to the Indus valley, is through the Bolan Pass to Dadur. There is another excellent road to Khelat. From Khelat there are two ways into this portion of the Indus valley, one direct but difficult, the other circuitous but practicable, both leading on Gundava. But the best road, one that with a little labour might be called good, is that through the Bolan, the length of which pass is 59 miles.

But when I speak of these roads issuing in the valley of the Indus, I must indicate the circumstances under which they enter it. The mountain barrier which has continued to define our frontier down to a point in advance of Mittree on the Indus, there turns west and forms the frontier of Khelat for a considerable distance, when it resumes its southerly direction. It follows that the right bank of the Indus from about Mittree to far below Larkhana is an immense plain. Travellers passing along the river there, see the horizon extending like that of the ocean. Into this great plain the Army of the Bolan would issue at a hundred miles from our frontier, and, while halting to concentrate its lengthened columns, and to fortify the passes in its rear, it would see before it a space of the valley of at least 150 miles in width, on any part of which to direct its attack; and having formed its plan it could, I am told on the best authority, advance in the dry season nearly everywhere across this plain on a wide formation and accompanied closely by all its trains and baggage. Regular routes lead from Gundava upon Larkhana, while Dadur, besides being in direct communication with Gundava, is the place whence most of the roads diverge leading to points in the specified portion of the Indus valley.

Now, though this plain is poor, and though it requires a little experienced management to obtain a good supply of water from it, I would put it to you whether such an invading army as I have imagined could reasonably hope for more favourable circumstances in which to enter a theatre of war than those in which it would here find itself.



Pausing for a moment here, let us look back to the other side of the theatre, and suppose that an army is also moving from Caubul to the Indus valley. We know that it will advance in long processional order down the Gomal or the Khyber Passes—that it will issue at once through narrow gaps, into the presence of the defender's troops—that it will have, or ought to have, to fight with the heads of its columns even for the power of making its first deployments, and that when deployed the greater part of the army will have at its back, not practicable lines of supply, or of retreat, but impassable mountains. It will not be contested that this is a very different situation from that of the Bolan Army—in the one case we have an army issuing, in the form of columns, close to the enemy—in the other an army advancing on a full front with the enemy still at a distance. I conclude, therefore, that however the enemy may think it proper to distract us by feints or diversions here, the main line of advance will be on the Lower Indus.

Next, as to how we should meet the invasion. The port of Kurra-chee is a point where troops and stores from England, from our Mediterranean stations, from Bombay, can easily and conveniently concentrate. It is also the terminus of the Indus Valley Railway, which, if not actually completed, is so near completion that I will take it as an accomplished fact. By rail, and also by the river, navigable for large steamers to beyond Sukkur, the readiest means exist of concentrating from home and elsewhere, as indicated, upon the Lower Indus. From Lahore, by Mooltan, the same part of the Indus is reached by rail—the communication across the river being by steainboat. And from Lahore also a railway now extending to, or beyond Jhelum, and which will shortly reach the Indus, affords a ready means of reinforcing Peshawur. This Indus Valley railway is not to be measured by the capacities of our English railways. It is only a single line, burns wood for fuel, and maintains but a moderate rate of speed. But, as it is, it is invaluable; it enables the Bengal troops to combine easily with those of Bombay, and it gives great facility for reinforcing either extremity of our frontier line. The Quetta column has already profited by it, having been conveyed by rail from Mooltan to a station opposite Mithun Kote; and all troops from Bombay or Kurrachee will also experience its benefits. And in a more momentous crisis than the present, such a one as I have been supposing to exist, we should bring our whole force to bear in this part of the theatre. In fact, there is, I think, no spot in the world where we could make such a military display of strength at short notice as on the Lower Indus. Thus, with the passes suitably guarded, the Army of the Lower Indus assembled beyond the river, the reserves at Lahore and Mooltan ready to reinforce either of our two Armies, we should be in a situation full of promise, and it was the consideration of it which caused me to express elsewhere the opinion that we ought, with good management, to give an excellent account of any foe who should attack us in the valley of the Indus.

But good grounds as there are for taking that view on our side, I

have also just endeavoured to show that the enemy's Army of the Bolan would meet us here under the most favourable circumstances that it could possibly hope for—its rear secured, its front open, its advance easy, and with a wide space of our frontier upon which to direct its operations. Moreover, it is to be observed that the railway so invaluable as our line of communication, and protected in its upper portion by the river, runs from Sukkur to Kurrachee on the right bank, and that we could scarcely hope, before having fought a decisive action, to guard it against the enemy's enterprises throughout the wide extent on which they would menace it. I will, therefore, now pass to the consideration of whether we shall not meet that enemy to much better advantage on a more advanced line.

The argument which is always put forward in support of the plan of remaining on the defensive is, that we should thus await amid our resources an enemy who would have advanced to a great distance from his. The argument thus stated would imply that it is always judicious to await invasion. But this is manifestly not true, for the majority of brilliant campaigns have been those of invasion. It is sometimes a judicious course, sometimes not. It is judicious when adopted by the weaker nation, deficient in the money, material, and organization which an offensive campaign implies, and at the same time possessing a frontier and a country topographically strong. But we certainly should not like to consider ourselves as likely to be the weaker party, either in resources or in organization, in the contest I have contemplated. Again, a defensive war will often combine the parts of an otherwise discordant empire in a patriotic union against the common enemy. But it is, I believe, the concurrent testimony of all Indians, that there is no territory on which it could be more perilous to give an enemy the chance of winning a battle than our Indian Empire.

Let us look, then, towards a more advanced line; and here our task is much simplified by the fact that we have already occupied Quetta. By doing so, it is *we* who are in the position of commanding an avenue into the enemy's country, and of securing the passes in our rear; while we have the further inestimable advantage of having reached the back of the mountain district—that is to say, of holding the issue of the frontier, and of seeing before us a country, not of course without its difficulties, but offering at the same time immensely increased facilities for skilled operations. We are thus, too, carrying forward our theatre of war out of our own territory, which we cover by our advance. And for communications, besides those before enumerated, the construction of the branch railway from the Indus to Dadur, already designed and officially talked of as intended, will annul in great degree the distance of Quetta from the frontier and remove any difficulties attending the march.

Looking next at the avenues *out* of Quetta, we find the high road to Kandahar, which offers no difficulty to the march of any column, except the Khojak Pass, the nature of which as an obstacle has, I believe, been greatly exaggerated. Another road to the left of it passes also over the Khojak range; and there is still another marked on the side of the desert. But, though our troops, in former campaigns,

frequently marched through that country, being in small bodies they moved only on one road, and we know nothing from actual observation of the two I have mentioned. There is another road which, branching north-east from the Kandahar road, a little way out of Quetta, traverses the hill country, and this, though very rugged, we know can be used by troops of all arms, for the Bombay division moved by it in the former war from Ghuznee upon Quetta. And what I would specially call attention to, lest you should think I had dismissed the subject of the passes too briefly, is that by occupying Quetta we practically close all passes to the Indus Valley which issue south of Dera Ismail Khan.

Strategically, then, I hope there remains no doubt of the immense advantage of holding Quetta, whether as a means of controlling Afghanistan or of meeting such a formidable combination of enemies as I have contemplated. Proceeding to inquire what tactical features it may offer, it appears that, on passing the Bolan, the road goes for some twelve miles over a waterless plain, before entering the cultivated district, also a plain, which surrounds the town. Quetta stands round an isolated conical hill which commands the plain behind it, but is itself commanded by high ground in its front. It became, therefore, of importance to know how this might be remedied: and I am informed by the very capable Officer who surveyed the district, that a mile or two in front of the town, and within Khelat territory, there is an excellent position, far out of reach of any other commanding ground, and dominating the valley beyond. This seems to be confirmed by a late telegram from there, which mentions an additional fort just constructed as having rendered Quetta quite impregnable. On the left of Quetta, between it and the desert, the line of hills is only passable at a single gap; and a similar range, not passable at all, exists on the right. Tactically, then, as well as strategically, for defence, as well as offence, against either a powerful or an inferior enemy, it would appear alike advantageous; and while the policy of taking possession of it has for many years been powerfully opposed, and while the measure was carried into effect almost unnoticed in this country, it appears, if the advantages are such as I have stated, that we have here the most valuable possession on which England has laid her hand for many a day.

Having got so far, however, the question is not yet settled of whether we have yet reached our most advantageous frontier. I have considered the confederated forces as within the triangle Herat, Caubul, Kandahar—the richest, most open, and most temperate portion of Afghanistan: and if they meant to attack us, whether in the valley of the Indus, or at Quetta, their position would be strong, and strong also against attack. Caubul would, so long as they might hold it, threaten Peshawur—and Kandahar would form a strong point of concentration for an advance. And the hostile Army so placed might, without imprudence, send an advanced force to occupy the Khojak Pass, the only very difficult or specially defensible part of the road between Quetta and Kandahar, about 90 miles from Kandahar, 60 from



Quetta, thus acquiring the option of receiving battle there, and, in case of its advance, the gaining of so much ground.

I will go on, then, to suppose that the result of our present operations is to give us the power, if we choose to use it, of occupying Kandahar, with a small space beyond it, necessary to complete its strategical value. The obstacle of the Khojak would thus disappear. At Kandahar, the richest district of Afghanistan lies before us. Several practicable roads lead from thence on Ghuznee and Caubul on the one side, on Herat on the other—and others lead from it down the Helmund to the Persian frontier and thence on Meshed, in the rear of Herat. The space beyond should therefore include a portion of the Helmund river, with the command of the passage at Girishk. Of the communications with Quetta I have already spoken.

It is to be noted that between Herat and Caubul, two of the great cities which I have supposed the enemy to occupy, lies the range of the Hazareh mountains, the road through which, between those cities, is so bad that the circuit by Kandahar, or by a route north of the mountains, is generally preferred. Hence another important consequence would follow from our occupation of Kandahar, namely, the rupture of the enemy's front; for if he occupied Caubul we could isolate the forces there from those at Herat—if he did not, we should be free to bring our whole strength to bear on the side of Herat. At Kandahar, too, we should hold such a position towards Persia as would seriously affect her relations with Russia; and finally, our presence there would be almost decisive against any design of the enemy to invade India through the passes. Observe, I do not say annex but occupy Kandahar, by friendly treaty, as we now occupy Quetta.

I think it is impossible to deny that our Army posted here, in a delightful climate, and with such strategical possibilities open to it, could desire no better field in which to contest with Russia and her allies the Empire of India. And perhaps many of you will think with me that the leader of that Army will be, in his opportunities, the most fortunate British soldier whom we have seen since Wellington.

Resting here, it becomes necessary to look at the other side of the strategical theatre, and to consider the question of an advance of our frontier-line from the Indus valley in that quarter also.

The road from the eastern issue of the Khyber to Caubul is marked by two chief difficulties. With those of the Khurd Khyber we are sufficiently familiar. Issuing from it a more open region presents itself, extending beyond Jellabad.

The idea that some advance of our frontier might be expedient has come to be generally contemplated; this is tantamount in many minds to considering that any step forward must be advantageous; and one step that finds favour is that of pushing the frontier forward on this side to Jellabad. One reason assigned for this is that we should thus command the valley which ascends from behind Jellabad to Chitral. This point would never, I confess, have occurred to me had it not been indicated elsewhere; it seems to imply that we may expect the Russians that way. But what does such an expectation mean? It means that Russia, after pushing her forces to the sources of the

Oxus—after forming a secondary base or fresh starting point on the plateau of Pamir—after crossing the Hindu Kush—is to march 250 miles down this valley, and for what? If she desires to reach either Caubul or the Khyber, surely she will possess herself of a more direct and convenient route to those places. If she does, why take this? If she does not, is it to be supposed that she will enter on such an enterprise by such a line? But it will be seen that the case can be provided for in a general plan, and I will pass to the other reason that has been assigned, namely, that we should thus have secured the passage of the Khyber. Now, the permanent occupation of a point beyond that pass must have either a defensive or offensive object. First, as to the defensive. If a point in advance of the Khyber were the knot where a number of roads united which led from thence into the Indus Valley, the policy of occupying it would be obvious. But it covers nothing, and commands nothing, but the pass itself. Now the difficulty of supply by such a road would prevent a very large force from being permanently posted there. On the other hand there is nothing to prevent a powerful enemy who may possess Caubul from bringing any force he pleases to attack the permanent post in advance of the Khyber, which must then be reinforced if possible from the rear. Nor would the difficulty be remedied—on the contrary increased—if our defensive post were pushed further, through the pass beyond, to the Caubul valley; a measure which, I believe, nobody has ventured to propose. On the other hand, if the reason for proposing to take up such a position is that we should thus have accomplished a step towards obtaining entrance into the district beyond the mountains in an offensive campaign, we must remember that between that district and Jellalabad there are many difficult marches and at least one most formidable pass. None but a strong and well-equipped force, in fact an Army, could venture thus to menace such a fortress, with such support beyond it, as Caubul would present under the circumstances I have imagined.

Now it is to be noted that an Army here would be separated from an Army on the Lower Indus by at least 500 miles—from one at Quetta by at least 700 miles—from one at Kandahar by 850 miles. The British armies would, therefore, be under separate commands, and operating with distinct objects; nor could they combine except after important successes gained within the enemy's territory. The enemy, on the other hand, would possess the advantage of operating from a common centre against widely separated bodies advancing towards that centre. In fact, considering the difficulties of supplying this Khyber Army, we should be voluntarily adopting, in its worst form, the double line with all its disadvantages, and without the excuse of necessity, since we could throw our whole weight with full advantage on the other side. I think, therefore, there is much to be said against, nothing for, the occupation of a post beyond the Khyber, and that it would be a source not of strength but of weakness.

In saying what I think should not be done, I am prepared to say what I think should be done on this side; and it is satisfactory to me to think that the alternative plan, while, in my opinion,

the best in the military sense, involves no extension of territory, no expenditure worth mention, and no increase of frontier force. It consists, first, in blocking the mouths of the Khyber on our side of it with an intrenched camp armed with powerful artillery, to be garrisoned by the Peshawur troops, reinforced in case of need. If this were suitably occupied, I cannot conceive how an enemy's force, however superior, advancing, as it must of necessity, in lengthened, even straggling, array to the mouth of the Khyber, could expect ever to issue from it. It seems to be one of those cases where a fortress, often so doubtful an expedient, would be absolutely effectual. By fortress I mean those lines of works about a central work, that combination of fortress and camp, affording space for the manœuvres of its garrison, which modern engineering science considers the best kind of stronghold. And to view the matter by the light of comparison, let us suppose an attempt to secure the other end of the frontier, in Sind, with its 150 miles of flat front, by means of fortresses. It is evident that in that quarter a single fortress would not suffice—a system of fortresses would be needed, such as would swallow up an army. But in front of the Khyber a very moderate force in a single line of works would answer the purpose.

In like manner, an intrenched camp armed with heavy artillery might be placed at the issue of the Gomal Pass and occupied by the garrison of Dera Ismail Khan; and another, though rather to strengthen the feeling of security than from necessity, in front of the Kurrum.

To complete the system of defence, these posts should have in their rear protected passages over the Indus, connected with the railway by branch lines.

It is necessary to notice the plan of sending troops up the different passes and occupying the crests by way of advancing our frontier. Now I scarcely think that those who propose it have considered what it would be to maintain permanent posts on those inclement crests, with only such lines of communication and supply behind them as the valleys afford. And considering them as a preparation for subsequent operations in a campaign, we should, in using these passes for an advance, be operating not by double but by quadruple or quintuple lines of operations. Surely it would be nothing short of criminal thus to fritter away our strength when we can unite our forces, under a single leader, on the side of Quetta or Kandahar.

To leave no alternative untouched, I will now suppose that we have pushed through all the passes, made the mountain territory ours, and placed our posts on the road from Caubul to Kandahar. Let us consider for a moment how an extensive frontier is generally guarded. The line of communication between the posts should pass not through, but behind their front. Any of them when driven back should have secure lines by which to find support from others, and all when retiring should possess, in numerous roads, the means of concentrating upon important points. But what of this do we see in our supposed new frontier? There we have bodies widely apart, isolated by the first advance of the enemy, each with its own narrow pass to retire into—entering which it continues to be isolated from the others for weeks,



till it emerges, still at a great distance from them, in our present territory. I trust we shall not incur the charge of such a vast extent of barren territory, with its savage populations, for such a result as this, and that our notion of a rectified frontier will not include any of these isolated lines and posts thus unmeaningly thrust forward into the mountains. Any good that could possibly be hoped for from them would be much more effectually accomplished by the force at Kandahar.

Apart from the question of a more formidable foe, it appears to be believed that these posts pushed up the passes would lessen the chances of future contests with the unruly hill-tribes. That they are unruly would appear an excellent reason for keeping them in our front rather than in our rear. Posts separated by such distances and such inaccessible country, can exercise no influence on the inhabitants between; on the contrary we should thus be offering them new and potent means of molesting us. I fear that slenderly-escorted convoys would offer irresistible temptations to the half-starved hill-tribes. Such a measure then, in time of war most mischievous, as multiplying chances of disaster, would be in time of peace costly and burthensome, for it would not in the least obviate the necessity of keeping up our present line of frontier guards.

When, in the former war, our forces moved on Kandahar, the tribes of the south were no less hostile and mischievous to us than those of the north, and every march from the Bolan to the Khojak was marked by their depredations on our trains, by the slaughter of their conductors, by the murder of stray soldiers and numbers of defenceless camp followers. But a few years afterwards they were rendered thoroughly peaceable and friendly by vigorous handling and judicious management. At least one most distinguished Officer who took a leading part in the process still lives to tell us what the process was. It might be worth trying on other parts of the frontier; however that may be, the result for us, and one well worth taking into account, is that, to all appearance, our trains march as safely now from the Indus to the Khojak as from London to Aldershot.

The plan, then, to which I arrive at the end of this train of reasoning, has at least the merit of simplicity. The camps in front of the passes become the fixed pivot of operations: the main forces, assembled in the first instance where they can most easily assemble, that is to say, on the Lower Indus, are the active army. As I have said, I should feel confident of the result even in the valley of the Indus; I think our position vastly improved by the occupation of Quetta; but I should think it all we could desire if we occupied Kandahar. And whichever of these two points we select for the advanced post of our line it must be made the site of an intrenched camp powerfully armed, the railway to Dadur must be made, and the roads between it and the camp everywhere improved.

There is one case in which the garrison of the camp watching the Khyber might cease to be merely a defensive force. If, in the course of the campaign, as is likely, the Kandahar Army or part of it should

invest Caubul, the troops might come though the Khyber to join in the siege and probably in subsequent operations.

Thus, then, I have endeavoured to sketch a definite plan upon which to concentrate our resources, and by which to secure a scientific frontier, and a permanent settlement of this large question. Looking at the northern half of this part of our territory, I think we should be thankful for possessing a frontier so easily rendered impregnable. Looking at the southern half, we have no less reason to be thankful for having acquired, in Quetta, such means of vigorous and effective action, and such an opportunity of securing new advantages of the most important and decisive kind. With a garrison strongly posted in its lines at Kandahar, with all the routes and stages by which our forces might be assembled on that point, all sources of supply, and all arrangements for transport, laid down, as our trained Staff Officers are certainly capable of laying them down, we might view calmly any possible complications before us, whether arising from the augmented military power of Russia in the East, from the success of her intrigues, or from her open hostility. The grounds of our assurance would be manifest and easily understood, our native subjects would soon learn to appreciate them, and what would be security for us would be tranquillity for India.

Major-General Sir FREDERIC GOLDSMID: Having been myself on two missions, one connected with Persia and Beloochistan, and another with Persia and Afghanistan, I know much of the western frontier of the latter country from general observation. As regards the eastern frontier of Afghanistan, my acquaintance with the subject is strengthened by long residence among Afghans, Beloochis, and people of the countries in the immediate neighbourhood, especially in Upper Scinde and Kurrachee. I have, moreover, long felt very great interest in the question of our Indian frontiers in the north-west, and have made it, more or less, a study. With this, therefore, and some other claims, however small, to express an opinion on the subject, I venture to state my thorough conviction that what General Hamley has proposed is exactly what we ought to do. I do not, indeed, know of a single objection that can be raised against his scheme, which has been so clearly put forward that it could hardly fail to be intelligible to all hearers. One very important advantage in holding Candahar is that by so doing, we really hold the main line of communication between Cabul and Herat. There may be another route to the north of the mountain chain, by Maimana; but it is rather roundabout, and probably not so secure and frequented as that by Farrah, Candahar, and Ghuzni. The road between Herat and Cabul by the Hazareh country is passable, and I believe troops have proceeded that way. I have been looking only this morning at Conolly on the subject, and have examined it by the light of maps. It is hardly, in my opinion, a direct route. From Herat its course is apparently to the south-east; it then turns up as if it were going to Bokhara, and then inclines towards Cabul, and joins the road which leads from that city to Bamian at a place called *Gardan-i-Diwar*. But I do not think that that road need really be taken into account, because it is a very difficult one—not only physically difficult, but difficult on account of the nature of the tribes through whose country it passes. There are, for instance, two sets of Hazarehs, the Sunni and the Shia divisions. To conciliate the one would not necessarily be to conciliate the other.

LORD WAVENEY: Those who have read the debate which has just taken place in the House of Lords will remember an exceedingly happy illustration, given by the Lord Chancellor, of the topographical circumstances of Afghanistan, in which he drew his parallel from Scotland. He requested his audience to consider that they have before them a large mass of mountains, such as the Highlands of Scotland represent. I derive from that illustration an opportunity of observing how old matters repeat

themselves, and how, when the new is ingrooved into the old, under the circumstances which have been presented by our lecturer, we may infer, from previous success, a success for the plan which he has proposed. Now it will be observed by those who are familiar with the circumstances of the mass of mountains of Scotland that those mountains were inhabited, in the old times, by tribes answering in their warlike character, as distinguished from those inhabiting the low lands, to the mountain tribes of Afghanistan, as distinguished from the dwellers by the Indus ; and it will be recollected, that one of the great difficulties of the English Kings in the annexation process going on, was to deal with these tribes ; and practically Edward I and his successors adopted the same principle for the permanent and sufficient mode of disposing of the disturbing force from the mountains as is suggested at the present moment by General Hamley, in closing the passes. It will be observed by those who have travelled on the seaboard and the inland great estuaries and rivers of Scotland that, at all points where a *débouché* from the hills might give opportunity for the northern clans to pour into the low lands, there is to be found a castle, not of ancient sea rovers, but a castle of the Norman military system. These castles show, by their position, what they were intended to do, and they had the effect for which they were designed, and in those castles I see the prototype of the fortresses projected by General Hamley. There is one point, I confess, on which I have always had considerable doubt. I suppose no Officer here present will recollect the battles of the Mysore and the irruption of the Mahrattas and Pindarees down the Western Ghauts into the plains of India, but I have heard old men describe the continued terror in which the plain countries were kept in the days when the Pindarees rode up to the gates of Madras. Where you have a mountain range beyond which the eye cannot penetrate, where you have not the means of acquiring satisfactory headquarter information, you will be continually vexed and harassed by the apprehension of what forces of aggression may be coming on its way, and what may be prepared behind that screen. If, therefore, this plan of barring the outlets, which has been adopted particularly in some portions of the Tyrol, be only a barring of the mountain outlets, I say that will be insufficient. It was very well remarked, by a very distinguished statesman in that last debate, when he said that we not only wanted the rectification of frontier, but we wanted to have eyes to see and ears to hear. One of the great troubles and difficulties of late years has been that continual permeation of hostile rumours through the defiles, greater or smaller, of the mountains of Afghanistan. But when the point of observation is projected into the plain, and represented by the intrenched camp at Candahar, we turn the mountain screen and see the glacis of the fortress. I quoted on the last occasion the illustration given by a German writer, that the north-western frontier was a fortress of which the glacis was not in the possession of the garrison. Now, we all know, if our artillery fire is to be worth anything, we must see the foot of the slope. We see along the reverse of the slope, as considered from the Indian frontier, from the outlook or *guérite* of Candahar, and therefore the occupation of Candahar has an especial value. And it has this especial value : it must draw upon it in advance the attack of the enemy. We know what is the objective point of any force coming from the north-west ; and it has occurred to me, on looking at the map, that a double advantage may probably be given by a road marked as abutting on the sea to the westward of the line of Kurrachee, that passes through Bela, and gives us a double access to our natural base, for the natural base of British war is the British fortress in communication with the sea, whence must come our stores. Woolwich should always be within reach of Kurrachee. It is at present. I have no doubt that the slopes of these hills within the territory of the Khan of Kelat may be made an additional line of defence ; therefore, as a means of keeping the aggressive force within its boundaries, as a means of seeing what is projected beyond our boundaries by a force that may become aggressive, I cannot but believe that in its simplicity this plan deserves most thoroughly the support which I am sure it will receive from those present, and will command the intelligent appreciation of the country.

General Sir GEORGE MALCOLM : I should be glad to know how we should protect our flank if we took up Candahar as an advanced post, and if it is not necessary that we should have positions in Eastern Afghanistan in order to secure moral influence



over its tribes and make them our allies? I fancy that a passive defence is the weakest defence that we can possibly have. What has been said by General Hamley suggests to me that we would have, as it were, half our frontier passively defended and the other half actively defended. It seems to me that the tribes of Eastern Afghanistan could roll down on our communications between the Bolan and Candahar if we did not gain an ascendancy over them, and I do not think that a passive defence would be sufficient either to establish our influence over that part of Afghanistan or to maintain it when it may be established. Perhaps some Officer may throw some light on this point in reply to what I have said.

Major-General Sir HENRY GREEN: I think that with regard to the general question of the strategical conditions of our Indian frontier, General Hamley has left me nothing to say, I entirely concur with him on every point. With reference to the questions asked by Sir G. Malcolm, I should hope that after the conclusion of the present campaign we should find ourselves again on friendly terms with the Afghans, in which case we should not, I consider, require in any way to meddle with Cabul. Holding Candahar, as suggested by General Hamley, and a narrow strip leading from Quetta to that position, I would leave to the Afghans the whole of the rest of their country, interfering with them as little as possible. Under such conditions I should have no fear for our communications with our own territory as far as Quetta. They would pass through an entirely friendly State, and thence to Candahar there are no tribes likely to give trouble under proper arrangements. With regard to the Punjaub frontier we must entirely separate its defence from the raids of the tribes inhabiting the Suleiman range of mountains, from the possibility of an Army of a powerful European State debouching into the plains with a view to attacking India. To meet the latter contingency General Hamley proposes the construction of strong fortresses at certain strategical points; to meet the former I would suggest the formation of a line of outposts along the whole frontier running close under the mountains connected by a broad, bridged road, and that all our own subjects residing within this line should be disarmed with a view to putting an end to the blood feuds which are carried on between the tribes residing in the mountains and those in the plains, and the continuance of which are one of the causes that lead to raids within British territory, and tend to keep the frontier in a constant state of excitement; but in taking away the power of retaliation from our own subjects, we must be prepared to afford them protection, and for this purpose the present strength of the Punjaub Frontier Force is insufficient and ought to be raised from 12,000 to 20,000. I would also suggest that every inducement should be offered in the shape of free gifts of land, &c., to the mountain tribes to settle with their families in British territory. Such a plan as that I have sketched has been tried and found to answer, certainly on a smaller scale, on the Scinde frontier; but no doubt to have to deal with hostile tribes aggregating some 170,000 armed men who acknowledge no central authority, and owe allegiance to no one, not even to their own tribal chiefs, except in a nominal form, is a question extremely difficult to deal with. I however entirely concur with General Hamley that such foes are far better in our front than in our rear, and that to push forward military posts amongst them would only aggravate the present unsatisfactory state of affairs. In conclusion I would add that with a British force stationed at Candahar, the Afghans friendly, and an Afghan garrison holding Herat, assisted by a few selected British Officers, we might contemplate without fear any movements of Russia in Central Asia having for their object an attack upon our Indian Empire.

Major-General FYERS: I think, Sir, that the very interesting lecture and scheme of defence which we have heard from Major-General Hamley covers to a great extent my own feelings and views in this matter, and that this important road from Candahar by Ghuznee to Cabul must always remain, in the eyes of military men, as the chief strategic line of operation in opposing an enemy coming from the north-west. I think there can hardly be a difference of opinion on this point; other approaches and passes there no doubt are, but I feel sure that the approach into Afghan territories by the Bolan and by Quetta is that which will at all times be most suitable and least open to objection of any kind. General Hamley has pointed out the very superior claims which Candahar has over any other position for strategic purposes, principally of a defensive character; and in regard to this, I do not think

there can be two opinions, for when you are at Candahar you are on the high roads either to Cabul or to Herat. In regard to the grand series of mountains and valleys between the Bolan Pass and the Suffaed-Koh Mountains, and again from that range to the independent territory of the Kafristan valleys, I do think that a complete change in our policy is desirable. My friend Sir Henry Green, with his large experience, thinks otherwise; he still approves the policy of holding entirely aloof from all the tribes in those mountains, and of regarding them as impracticable barbarians. Now I cannot but regard with suspicion and dislike a policy which proposes for all time to entertain for these people those undying sentiments of suspicion and of armed hostility; I feel compelled to believe that an honest desire for their improvement would command the means of insuring that improvement; and that what may now seem to appal in such an endeavour, would with each succeeding year yield to the strong compulsions of an organization having for its ultimate aim their good, and the well-being of their descendants. Whether this task is difficult or not, I think it ought to be carried out for our own sake, as well as for the people who are our neighbours. At the close of this present war, Afghanistan must of necessity become a protected state of the British Empire—a position which we cannot escape from; and whether we like it or not, Afghanistan must come under our guardianship and our tutelage. The sooner we recognize this to its full extent, the better for us and for them.

Lieutenant-General OLPHERTS, V.C.: I am aware that it may appear presumptuous on my part to address such an assembly as this, particularly if my remarks should seem to differ from those of such an able authority on military strategy as General Hamley; and I am also conscious that everything bearing on the political aspect of the question before us, must in this Institution be avoided as much as possible. Nevertheless, when I say that I am no politician, and am free from all party bias, and considering that I am at any rate an older man than General Hamley, I trust you will grant me your kind indulgence. It is now nearly forty years since I went out to India as a boy—and at that time the first Afghan war was going on, and my relative, Sir William MacNaughten, was the Envoy there; and had he not been killed in time I probably should have been sent up to join, and should have been killed with him—so that the question of Afghanistan was deeply impressed on my mind in my younger days, and that impression has remained ever since. I was also fortunate enough in those days to encounter men of note—among others one whose name should send a thrill of emotion through this meeting, I mean, of course, Eldred Pottinger, of Herat celebrity. Herat was considered then, and it always must be, the key of India from the north-west; without it we have not proper military possession of India. The Hindu Kush is the natural boundary of India; its very name denotes this. No doubt, arrangements, good in themselves, may be made of a temporary nature; but, depend upon it, the proper military boundary of India, if we are to stop short anywhere in that direction, must include Herat and Cabul, by which means we shall control Persia on our western side, and keep Russia at arm's length, and not otherwise. I quite agree with General Fyers in what he says, and I can see he is of the same mind as I am, only, perhaps, he does not care to speak as audaciously as I may be doing. I say that, to admit for a moment that Russia is to be allowed to descend into the plains and valleys of Afghanistan before we meet her, is, to my mind, utterly wrong. We must never dream of such a thing. We may hold back from annexing Afghanistan, but I think the best thing we can do for the Afghans themselves, as for our own political and military supremacy in India, is to annex and incorporate that country with our Indian Empire. I told a brother of Lord Lawrence, who, I regret, has committed himself to a different opinion, when he asked me what we should do, "Take Afghanistan, and keep it." This I said at the outset of the controversy, before war was declared, and I have never since swerved from that opinion. On the contrary, it grows stronger with me every day I live. Depend upon it, we shall make the Afghans far better friends of ours if we do so; we shall only irritate them by half measures, such as taking Candahar, and blocking them up in the Khyber and other passes (on the wrong side, by the way). Are the tribes around Peshawar friends of ours? I was with Sir Charles Napier in his hill campaign in Beloochistan, also with Sir Neville Chamberlain, in an expedition against the Wuzerees in the Kurrum Valley, and likewise with Sir Colin Campbell and Sir Sydney Cotton in the

Peshawur Valley, and can therefore speak from experience of the frontier tribes. You cannot put your nose safely out of Peshawur in the most peaceful times. Are we to go on for ever in this state? It is intolerable that we should have to do so; and the only effectual remedy is to "take Afghanistan, and keep it," when India will be perfectly quiet and tranquil, and the Russian boundary, if need be, continuous with ours. Our true glacis is on the other side of the Hindu Kush down to the Oxus; and anything short of that I consider unworthy of the dignity of the British Empire!

In conclusion, I would beg to disclaim any idea of arguing with or pitting myself against such an able lecturer and strategist as General Hamley, who, if I attempted to do so, would doubtless soon "turn my flank and stop up my passes!" and, not to trespass too much on your kind consideration, I will now sit down.

General Sir EDWIN JOHNSON, R.A.: I have listened with extreme interest to what General Hamley has said, and I can only regret that his observations were not more extended, and that he did not go further into details. I do not know whether General Hamley is aware that we have occupied Peshawur for nearly thirty years, and that we are yet debating what description of fort we ought to erect there. I should like to hear a description of the nature of the forts and works with which he proposes to defend the entrance to the passes, whether they are simply to be considered with reference to the frontier tribes, or whether he anticipates a more formidable foe. It would be advantageous if General Hamley would inform us whether his strategical arrangements are designed for the purpose of meeting the aggressions of our old tribal frontier foes, or whether he has in view a new and more formidable enemy. The financial question of our frontier defence is a very serious one, and our chairman, Sir Henry Rawlinson, will bear me out when I say that, mainly on financial, though partly on sanitary grounds, we have been nearly thirty years deciding whether we shall have a fortified post at Peshawur or not. I should be very sorry to think that another thirty years will be spent in debating what works shall be erected for the security of our rectified frontier. I put forward those remarks in hopes that we may have a little further information on this point, which, however, I am quite aware is a tactical rather than a strategical one.

Major-General HAMLEY: I thought I had made it quite clear that the works I had proposed to establish in that place were against the most formidable enemy we could expect, and that if those works were such as to provide against that enemy they would so much the more provide against any incursions of the hill tribes. I quite concur with all that the different speakers have said about the policy of improving the condition of those tribes. It seems to me a positive duty on the part of a country like ours that, when we come in contact with uncivilised people, we should leave them better than we find them. But, while strongly of that opinion, I do not myself in the present case want to see the Afghans converted by sending military missionaries up the passes. I dare say General Olpherts will excuse me at this advanced stage of the discussion from following him into the recesses of the Hindu Kush. I will only observe, in reply to him, that the plan I proposed for placing those works in front of Peshawur at the issue of the path would close all the passes of the mountains, whether in the Hindu Kush or elsewhere, inasmuch as those passes debouch into the one of which I spoke. As to the nature of the works to be placed there, which formed the subject of Sir Edwin Johnson's question, of course, he knows, as well as I do, that it is impossible for anybody not on the spot to tell precisely what description of works would suit the ground; but we all know what an intrenched camp is, and I have not the least doubt that there are a hundred engineer Officers now in that country who would in a week provide a plan which would sufficiently answer the purpose. In conclusion, I have only to say that deeply impressed as I am with the truth of the views I have expressed, it has been the greatest gratification to me to find them receive the sanction and authority of so many distinguished Officers.

The CHAIRMAN: With my very limited practical experience of the art of war, the former Afghan campaign being the only occasion on which I have seen any active service in the field, I feel it would be unbecoming in me to examine in any detail the professional views which have been put forward by General Hamley, and which have been generally approved in the course of the very instructive discussion



which has followed. But perhaps I may be allowed to state that approaching the subject from an entirely different point of view—that is, not exactly from a political, but from a general common-sense point of view—I concur, and always have concurred, with the views which General Hamley has expressed. It has, indeed, always been my opinion, since I first turned my attention to the subject, that it was our true policy to look to western Afghanistan, that is to Candahar and Herat, rather than to Cabul, and if I may be allowed to read a very short extract from what I wrote fourteen years ago, you will see that I then put on record opinions identical with those that have now been presented to you by General Hamley. I then said, “If Russia should take possession of the Oxus as she has already taken possession of the Jaxartes, then as her outposts would be in contact with Afghan outposts it would become a question for serious consideration whether, leaving Cabul and Ghuznee, the scene of our old disasters, to struggle on in isolated anarchy, it may not be incumbent on us to secure a strong flanking position by the occupation of the open country of Quetta and Candahar, and even of Herat.” I further said, “The time may come when it will be our duty to remember that outworks are as necessary to the defence of Empires as of fortresses, and that in this view Herat and Candahar are the Malakoff and Mamelon of our position in the East.” Now, without troubling you with details, perhaps I may be allowed briefly to state the reasons which led me to that conclusion. Cabul is, probably, as awkward a place to hold and to govern as any city in all Asia. In the first place, the capital and its neighbourhood are inhabited by a fanatical and disorderly population, incensed against us by the memories of the former war, who yield a very doubtful obedience even to Shere Ali himself, and who would, of course, be still more unmanageable under any attempt at coercion on our part. I always felt, therefore, that it was desirable, if possible, to give such a place a wide berth, and General Hamley has now, I think, very satisfactorily pointed out that such a course is possible, since Cabul, if left to itself, can do us no harm, provided that we are strong at Candahar; and that we also shut up the Khyber Pass so as to close all outlet for the discontented and hostile spirits at Cabul to emerge upon the plains of India. At Candahar, on the other hand, I desire to impress upon the meeting that everything is in our favour. The people in the town and country around are in very few instances real Afghans—they are Parsiwans opposed to the Afghans in race, in language, and in religion, and they have always been most friendly to us. The climate again is healthy and agreeable, supplies are abundant, and there would be no more difficulty, in a military point of view, in our holding Candahar than in holding any ordinary cantonment in the Punjab or in Scinde. The military position of Candahar is, moreover, admirable. General Hamley has already drawn attention to the fact that it intercepts the line of communication between Herat and Cabul, but it does much more: in the first place it supports Herat in a very effective manner; for, supposing us to be in possession of Candahar, with a railroad laid down as far as Dadar (and possibly to be continued through the Bolan Pass and on to the Afghan plateau), we should be in a far more efficient position to succour Herat than Russia would be in to threaten it from her remote base on the Caspian or Aral. Again, the possession of Candahar would render any attack on India from the Hindu Kush almost impossible, either by Cabul and the Khyber, or by Ghuznee and Kurrum, since our position at Candahar would flank both lines. Another point to be considered is that Candahar is in the direct line of attack; for if an army ever should invade India from the west or north-west, it would certainly march by the line of Candahar, where there are no mountains to be crossed, and no physical difficulties worth speaking of to be encountered, the great line of the Hindu Kush being turned, and the country being so flat and open that a carriage may be driven with comfort from the Helmund river to Teheran. There is hardly in fact a hill of 100 to 200 feet in height on the entire line, and if an invasion of India is ever to be attempted, it would certainly therefore be conducted by that route. I fully agree also with General Hamley that strong entrenched camps, not of course of the size of Metz, but of that description—not only fortresses, but large intrenched camps in addition, capable of holding a force of 10,000 or 20,000 men; such camps, I say, at the mouths of the passes would render our position in India perfectly impregnable. There are two or three smaller questions on which I am not prepared, perhaps, to

give in my adhesion as completely as General Hamley would wish. I think, for instance, it is still a question whether, putting aside the idea of going as far into the interior as Jellalabad or Ghuznee, it still might not be desirable to hold the passes by a small post at the upper end, as well as the intrenched camp at the lower end. This is a minor point, I know, but it is one in which my mind is not entirely satisfied with General Hamley's scheme. The holding the Khyber, for instance, by a small post at Dacca, as well as by the large camp at the southern entrance, would give us a command of the whole length of the pass, which would be invaluable for the protection of trade and for general passage; whereas, if we only held the lower mouth of the pass, we might be perfectly safe and strong strategically, but we should be neglecting those legitimate calls on our protection which the position would seem to require. In the same way, I should be very loth to restore the Kurrum Valley to the Afghans. How far the Peiwar Pass can be held by outposts at the upper end of the valley I cannot attempt to say, but the valley itself is certainly a very desirable position, since the inhabitants are friendly and the soil is fertile, and the geographical situation is certainly of value in enabling us to locate a force within a very convenient distance both of Cabul and Ghuznee. Although I may disagree with General Hamley on small points of this sort, I am bound to say that, in regard to the great general question, we should not attempt to occupy the whole country of Afghanistan, but should rather block up the eastern defiles by intrenched camps and merely hold the western part of the country in military strength; on that broad question I am entirely in accord with him. I think it is hardly worth while to go into the still larger question which has been put forward by General Fyers and General Olpherts. To step at once from the plains of India to Kafiristan and the line of the Hindu Kush is such an enormous stride in advance that it almost takes away one's breath to think of it. We certainly could not take up that line of frontier and defend it without an enormous increase to our military strength, which would entail extra expense of a million or two millions a year, and in the present state of the finances of India, I really do not see where the money is to come from. I would beg, gentlemen, to remember that in all matters, military as well as political, we have to regulate our proceedings according to the old maxim of "cutting your coat according to your cloth." With an impoverished exchequer we cannot branch out into theoretical or sentimental lines of frontier. We cannot occupy the line of the Hindu Kush, although upon the map such a frontier may appear very symmetrical and very desirable, with any ordinary regard for the resources of India. India cannot afford it, and I am obliged, therefore, to confine my line of vision to something less ambitious, but more practical, to measures of defence less expensive, but, as I believe, thoroughly sound and scientific, such as have been treated of by General Hamley. I will only further say that, whatever our military action may be, either in the passes adjoining our frontier or at a distance in the plains of Candahar, I feel satisfied that our influence and our presence may be made most beneficial, not to ourselves only, but to the people of the country. Wherever we have already established posts along the frontier of the Afghan hills, we have exerted a most civilizing influence on the tribes of the neighbourhood; and it has often occurred to me, arguing from this experience of recent years, that if we had only continued to have held Afghanistan from the year 1842, when we needlessly abandoned the country, and to have exerted the same kindly beneficent influence that we have exerted in the districts below the hills, I believe the greater part of Afghanistan at the present day would be as orderly, as quiet, and as flourishing as the happy provinces of the Punjab and Sind. Remembering what might have occurred in the past, it is a pleasing prospect to look forward to something of the same sort in the future. I will, in conclusion, ask you to pass a vote of thanks to General Hamley.

Lord ELCHO: Before we close, I should like to put a question. The question of Herat has been alluded to in the discussion upon the very able paper to which we have listened. General Hamley proposes that the extreme point we should occupy in this so-called rectification of frontier should be Candahar. General Olpherts said that Herat was the key to India, and I believe Russian opinion is the same. I have a correspondent in the East who is in frequent communication with the Russians, and he informs me that they speak extremely freely to him upon various points, and

that they are unanimous as to the value of Herat. They further laugh at those English who are deluded into the belief that they (the Russians) eventually have no designs upon India. He further says that they look upon it that it must turn upon who can get first to Herat. Now we have heard, from our Chairman, whose most able paper upon the political aspect of the question, which is published in the Parliamentary papers, contains all the law and the prophets on this subject, that about the time when that paper was written, he considered Herat and Candahar as the Malakoff and Mamelon of India. Now the Malakoff, we all know, was more important than the Mamelon, and I should like, as General Hamley has only occupied the Mamelon, which is Candahar, to hear from General Rawlinson that he is still of the opinion which he expressed, ten or twelve years ago, that it is as essential, with a view to our safety, that we should occupy Herat as that we should occupy Candahar.

The CHAIRMAN : I purposely avoided touching on the question of Herat, except in general terms, on account of the extreme difficulty of discussing it. I think that General Hamley proposed, or foreshadowed the possibility of, our supporting Herat from Candahar. Candahar is necessarily the first stage of our proceedings, and I should be almost inclined to say "Sufficient unto the day is the evil thereof." At any rate, we must occupy Candahar in the first instance. If the necessity arises, and it may arise, I then would venture on a further advance from Candahar to Herat, but I must be allowed to repeat the qualifying clause "if the necessity arises." So long as Herat is not threatened, I think it would be very rash, and in fact needlessly offensive, to thrust a force nearly 400 miles in advance of Candahar, an advance which would cause great additional expense in keeping up the communications. It would, moreover, keep us more or less in hot water with all our neighbours. But I have no hesitation in saying that rather than Russia should occupy Herat, I would imperil the safety of India, in order to gain possession of it. I would give up all the rest of Afghanistan rather than that Herat should be in the hands of Russia, but so long as it remains in its present condition in the hands of the Afghans, independent of Persia and independent of Russia, so long I would not in any way interfere with it further than by giving it our moral support from our advanced position at Candahar.

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NOTE BY COLONEL SIR WILLIAM MEREWETHER.—General Hamley's estimation of the value of Candahar to the holders of India is certainly most sound. Candahar is *the* strategic point. It not only forms the best position from which to advance to Herat when necessary, and to afford support to the occupiers thereof; but no hostile force could dare to venture on attempting an approach to India by Kabool and the Khyber while we hold Candahar in strength. Candahar thus held would do away with the necessity of the proposed large fort at the mouth (eastern end) of the Khyber Pass. Candahar has other great advantages, viz., in facility of communication with its bases. Between it and Quetta the country is easy of transit. There is but one pass, the Khojek, which sappers would soon make practicable for wheel traffic. The inhabitants have always shown themselves most friendly towards us, and, we hear, are doing so now. Quetta commands *all* the good roads from Afghanistan to the sea—not merely that by the Bolan, but the others by Kelat and the Moola Pass to Gundava, and by the hill route through Beloochistan to Soonmeanee and Kurrachee. Our influence in Beloochistan being now secured, all these roads are perfectly safe. From Quetta to Daduris but 84 miles, of which some 60 are through the defile of the Bolan, a good road for a mountain pass. Beyond Dadur to the sea, a distance of nearly 450 miles, mainly through British territory, is all dead plain. Railway communication already exists for more than 300 miles of this distance, from Sukkur on the Indus to Kurrachee, and a few months more should see this extended to Dadur. The immediate base for Candahar is unquestionably Kurrachee. It is the nearest and most quickly reached. The connection is complete and safe. All the resources of the Bombay Presidency, with which it is in easy (two and a half days) communication by sea, can there be readily availed of. And at the same time every facility exists for extending the



call for the best munitions of war and reinforcements to Woolwich for the first, and to the home garrisons for the last.

The troop-ships leaving Portsmouth could reach Kurrachee in 30 to 34 days. Kurrachee is 180 miles nearer Aden than Bombay is. The harbour at Kurrachee, since its improvement, has 28 feet of water on the bar. This will allow of the above ships entering the port at any time during the fair season—also the trooping time—from October till May. Troops and stores would then be placed on the railway, and could be conveyed to Sukkur in twenty hours. In addition to the railway, the River Indus can be used for the conveyance of stores. There is a fleet of steamers on it, each of which tows two large cargo barges, and the trip from Kotree to Sukkur is made in six to twelve days, according to whether the river is high or low. There are no difficulties in navigating the river in this part. With rail and river combined, the transport of stores of all kinds would be most easy and expeditious.

# OCCASIONAL PAPERS, NOTES,

AND

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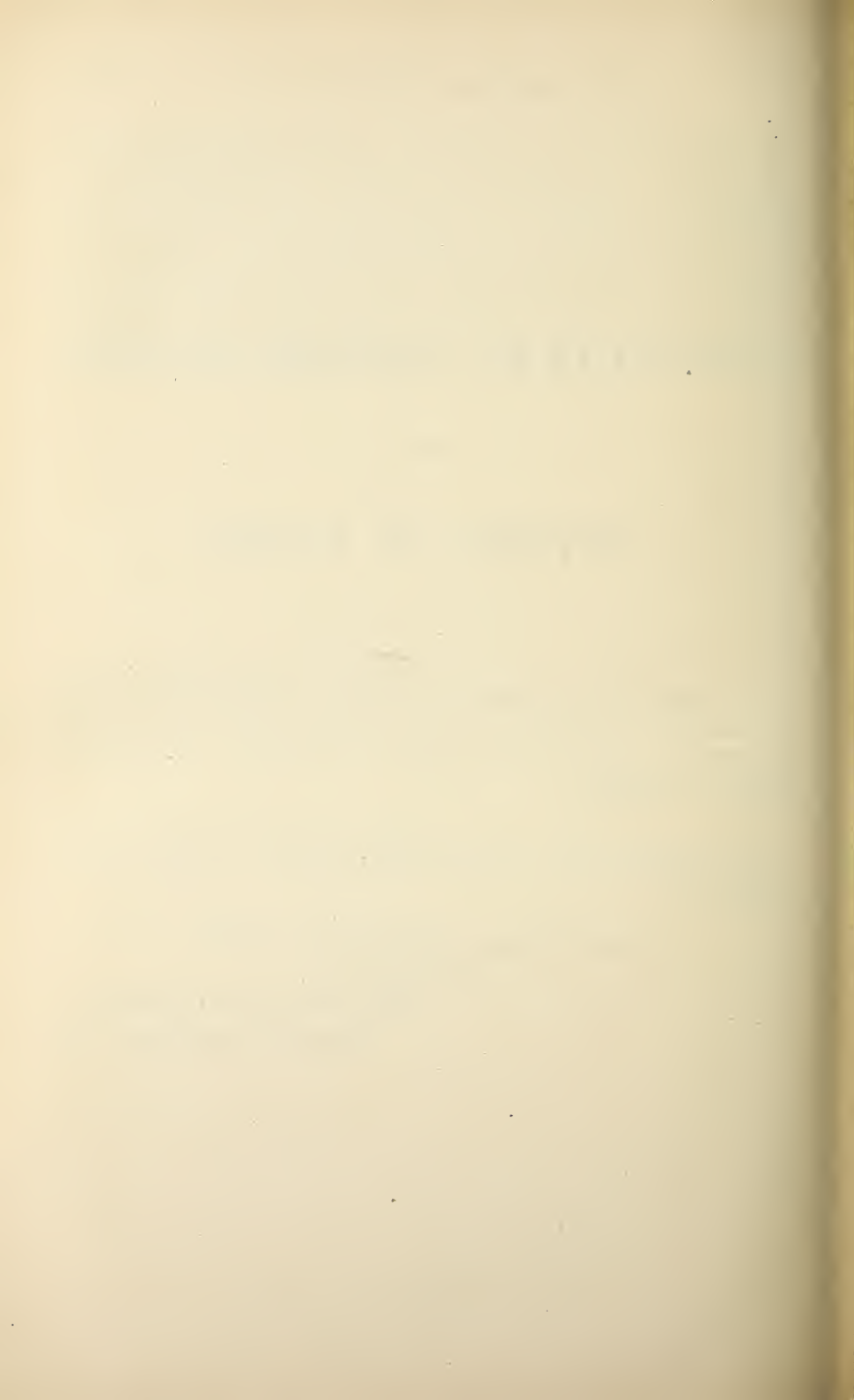
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## RUSSIAN TORPEDOES ON THE DANUBE, AT SOUKHOUM, AND AT BATOUM (*Concluded*).

Translated from the *Revue Maritime et Coloniale*, by Lieutenant  
J. E. MERYON, R.N.

IN this paper we shall continue the series of affairs in which, during the Russo-Turkish War of 1877-78, torpedoes have played an important part; there are four accounts to be added to the previous ones; the unsuccessful attacks being more numerous than the successful. We shall find employed—spar, towing, electric, automatic, and Whitehead torpedoes. We have obtained information in certain cases from English sources.

We have tried to separate truth and fact from exaggeration. Often this was not without much trouble, when the sources of information vary as to the number of torpedoes fired, when they describe as exploded in contact torpedoes which were fired too far from a ship to do any damage, or when they state that a Whitehead reached a vessel, when everything tends to show that the torpedo was fired by the nose striking against some rocks, and that it passed under the ship.

We again meet the familiar names of Makaroff and Zatzarenniyi. The former, a Lieutenant at the outbreak of the war, had been within eight months successively appointed Lieutenant-Commander, Captain of 2nd Class, Aide-de-Camp to the Emperor, and decorated with several orders. The Russians know how to reward good services.

### *1st. Day affair of the 23rd June, 1877.*

At the time that the Russians were preparing to cross the Danube at Simnitsa, they endeavoured to rid themselves of the Turkish monitors, which, anchored under the fortified places on the river, such as Rustchuk, Silistria, Widdin, Nicopolis, hindered the preparation for this enterprise. They endeavoured to establish, here and there, lines of torpedoes, and thus to check the movements of the enemy. They succeeded in this manner in sinking two monitors. A third had until now escaped, and by her vigilance had extremely inconvenienced them. She performed wonders of energy and activity, at other times unusual Turkish characteristics, continually harassed the Russian batteries, and sank their boats. At last, the Russians resolved to attack her, and to launch their torpedo-boats with torpedoes for this purpose.

On the 23rd June, in the vicinity of Olti, near Flamound, Major-General Leonoff, who commanded the Russians at this spot, having observed that the Turkish monitor was starting from Nicopolis to go down the river, ordered two torpedo-boats, the "Choutka," commanded by Midshipman Niloff, and the "Mina," commanded by Sub-Lieutenant

Arens, to conceal themselves behind an island, and to observe the passage of the enemy's ship. When she exposed herself on their path, they rushed at her, rigging out their spar torpedoes, these being of the same style which Doubasoff had used at Braila. But their success was very different from his. The Russians perceived rapidly that they had to deal with altogether a different sort of adversary than the monitors which they had previously sunk. With astonishing smartness she prepared for the attack; she let fall nets, and rigged out from her sides, spars furnished with torpedoes, capable of blowing up the first boat which came near her. At the same time she opened a lively fire of case shot and musketry, which would have been most annoying for the assailants, had they not been provided with shields or covers. It is remarkable that she did not fire a single solid shot, despairing probably of striking adversaries so active, and placed so low and near to her. She avoided their approaches, by quick and active movements, suddenly going astern, stopping, going ahead, and puzzling, every moment, her diminutive but dangerous enemies. Sub-Lieutenant Arens, in the "Mina," had attacked first, but one of the torpedo wires was cut by a shot, then the boat herself was damaged, and he was obliged to retire. Niloff, on his part, who was thus left alone, struck against a torpedo-spar projecting from the fore part of the monitor, and drifted aft along the port side, at a distance of about 6 feet, trying to strike her; but, whilst a discharge of case threw a quantity of water into the port side of the "Choutka," the monitor put her helm to port, and thus exposed her stern to the boat's torpedo, Niloff passed across to starboard, but, half full of water, and his boat having lost her way, did not succeed in blowing up his adversary.

There was not much for them to be ashamed of; it was a European, an Englishman, who had conducted such a splendid defence. The Russians recognized, on the bridge, the Captain of the monitor; he was a tall man, with a long, fair beard, standing nearly motionless with his hands in his pockets. This plucky man was not long satisfied with only avoiding the boats; he took the offensive, and, seizing his opportunity, was able to get one of the boats between his ship and the shore, at a very little distance from the bank. The bow of the monitor being pointed broad off from the shore, he went astern, in the hope of crushing the boat, whose bow was towards the shore. At this moment the Russian engineer was wounded, the boat's crew—the boat being thrown on shore by the current—were seized with a panic and jumped on shore; but some of the braver of them got into the water, got the boat afloat again, put the engines on to full speed, and saved her; she only received some slight rubs. One of the Russian Officers who had jumped on shore during the scrimmage, fired, at about 15 yards distance, three shots with his revolver at the Captain, who quietly took one of his hands out of his pocket, raised his cap, bowed, and gravely resumed his position of immobility. He had not been touched.

The fight lasted yet for an hour; at last the brave Englishman was wounded, he had to go below, and his ship returned to Nicopolis without any further pursuit.

His adversary, Niloff, had not been wanting in either audacity or courage, although his enterprize had not succeeded; he had received four or five wounds, according to the official report. He was rewarded with the Cross of St. George, 4th Class, and Arens received the Order of Military Merit.

Subsequently, the monitor was shut in between the lines of torpedoes, and placed out of power of action; she had no longer her old Captain. The English newspapers said that if all the Turkish monitors had been commanded by officers of his stamp, the Russians would not so easily have constructed the bridges of Simnitsa and Sistova.

The affair which we have described presents much interest; it illustrates, perhaps for the first time, a ship opposing torpedoes to other torpedoes carried by boats; and also manœuvring to rid herself of her enemies, like a lion defending himself against cats. We must observe that the accounts of this affair which we possess are almost entirely English, but one of the correspondents, that of the "Daily News," was writing from the Russian side. From that side we have only a very concise report of the Grand Duke Nicholas, and a telegram which he begins with these pompous words:—"The bravery of our sailors is unimaginable, incredible, and unheard of," and in which he proceeds to allow the failure of the torpedo-boats. From other quarters, the Russians paid their adversary his just tribute of admiration.

*2nd. Night affair of 23rd-24th August, 1877.*

In August, 1877, the Turks seized upon Soukhoum, a little semi-circular bay, exposed to south winds, and protected by a bastioned fort. The Russians were manœuvring to regain possession of this port; one column of troops, under the orders of Colonel Chelkofnikoff, were following the coast between the river Sotcha and Cape Pitzound, intending to pass through the narrow passes of Hagra, one of which skirts the sea, and the other crosses the mountain some distance in the interior. All this coast is very high, rocky, and thinly populated, and very inaccessible. Here and there the Russians have built forts, Navaginsk, Saint Douka, &c., in places where a ravine watered by a stream renders communications possible.

The "Constantin," Lieutenant Makaroff, received orders from the Commander-in-Chief of the Black Sea fleet, Adjutant-General Arkas, to help Colonel Chelhofnikoff in his march on Soukhoum-Kalé, and especially to take care that he was not taken in flank by the Turkish ironclads, in his passage of the sea-coast pass of Hagra. Leaving Sebastopol on the 16th August, the "Constantin" arrived on the coast of Abkasia on the 18th, and cruized the whole day between Touabse, Cape Sandripeh, and Adler, without being able to obtain reliable information as to the exact position and movements of the Colonel. During the night she sent off her four torpedo-boats, the "Tchesmé," "Sinope," "Navarino," and "Torpedoist," to continue the search, to visit the coast as far as Hagra, to assure themselves of there being no ironclads there, or to sink them if they could. The boats, after a useless course of five or six miles along the coast, were



hoisted up again on board the "Constantin" about four in the morning. Makaroff found himself at daylight off Hagra, where he heard a lively fire being kept up; suddenly he observed an ironclad, which, covered by the land, had been invisible to him, coming towards him, whilst his own ship, standing out against the sky, had been immediately noticed by his enemy. The "Constantin" drew the enemy off the shore, being able to steam 12 knots, a speed which the Turk could not approach; however, after a couple of hours, a squall of wind and rain separated the combatants. Nevertheless, the intervention of the "Constantin," in drawing the ironclad off the shore, the former, in spite of all her efforts, being still ignorant of the movements of the shore column, had the effect of freeing a Russian column, which the fire of the ironclad had placed in jeopardy, and allowed it to take up a more favourable position. Thus it is that during war, movements apparently futile, performed in execution of orders, produce results which those who perform them never suspect, and which should encourage the patient accomplishment of every duty, even though its object may be obscure. On the evening of the 19th, the "Constantin" found herself again on the coast, at Sotcha and Adler. During the night the torpedo-boats were again sent away, and in spite of a heavy swell and rain, and a heavy storm which raged, they reconnoitred the shore as far as Hagra, and assured themselves that the Russian column had not been able to drive the Turks out of it.

Makaroff now returned towards Novorossisk. There, remembering that a lunar eclipse took place on the 23rd, he resolved, in consultation with the captains of the torpedo-boats, and with General Arkas, who was consulted by telegraph, to take advantage of this phenomenon, to attempt an attack on the Turkish ironclads, anchored in the creeks or bays of the coast. General Oklobjio had previously informed him that some were always anchored in Soukhoun Kalé, and also promised to send, on the morning after the eclipse, detachments along the shore to look after the torpedo-boats and to render them assistance in case they should be obliged to separate from the "Constantin."

The latter quitted Novorossisk on the evening of the 22nd August, arrived at Sotcha on the following morning to obtain information, then stood 35 miles out to sea, where she met a quantity of Turkish small craft laden with Abkasian refugees; returned in shore at sunset, and at ten o'clock was 6 miles from Soukhoun Kalé.

Makaroff now got ready his four boats.

1st. The "Sinope," Lieutenant Pisarefski, with a midshipman, a pilot, and five petty officers or seamen.

2nd. The "Torpedoist," Midshipman Nelson Hirst, aided by Lieutenant Koroleff, Officer torpedoist, with five petty officers or seamen.

3rd. The "Navarino," Lieutenant Vichnevetski, with five petty officers or men.

4th. The "Tchesmé," Lieutenant Zatzarennyi, a pilot, an engineer, and four men.

Zatzarennyi, Officer torpedoist, whose courage was never shaken by several expeditions of the same sort, though generally unsuccessful,

received the command of this one. His mission was to destroy the pile stockade which they *wrongly* supposed to exist round the iron-clads, and to blow up two of them.

The boats, each towing a "wing" torpedo, left at half-past ten in fighting order, in two lines, the "Tchesmé" followed by the "Torpedoist," and the "Sinope" by the "Navarino." Each pair of boats was, rendering mutual aid, to attack an ironclad. The full moon was still in all its brightness, and certain brightly lighted buildings at Soukhoun indicated their way to the Russians. At 10.45 the expedition met a little sailing boat, avoided her and did not continue their advance until she had disappeared under the shore, at 11.30 they were three or four miles from the town and stopped to wait for the final darkness of the eclipse. The eclipse began about 11.45, and when, two hours later, the moon had a third or a half of its face hidden, Zatzarenniy went on ahead, steering towards Kelasour, a village situated about  $2\frac{1}{2}$  miles south-east of Soukhoun, in order to observe better, as he left there, the vessels anchored in the roads. At 2.45, the eclipse being nearly total, the boats, as they followed the coast, arrived near enough to the town and to the roadstead to discover a quantity of feluccas secured to the shore, and to the left of them, two ships, towards which they steered, which were moored with their heads in shore about two cables from the shore, in six or seven fathoms' water. Instead of the darkened moon, the scene of action was lit up by the hospital establishment, and by an immense pile of wood which was blazing on the beach. Round this fire they could see moving human forms, a drum was beating, and quite close a battery of guns was stretching away into the darkness. It was a scene that might have been painted by Rembrandt.

One of the two ships was an ironclad, the "Assai-Chefket," brigrigged; she was the nearest to the Russian boats, and showed her starboard side towards them; the other was a merchant ship. The "Sinope" and "Navarino" advanced towards the ironclad with their "wing" torpedoes rigged out. Hailed by two "*Qui vives*"? to which they did not reply, the Russians steered for the midship part of the "Assai-Chefket," and nearly reached it, in spite of the fire from the ironclad, with which the shore battery joined in; but they had not noticed a Turkish boat which was manning at the foot of the accommodation ladder. Hence the "Sinope" and "Navarino," in firing their two torpedoes with those "Hurrahs" so dear to the Slavs, only reached the woodwork of the ironclad, without seriously damaging the hull. Makaroff says in his report that the explosions were very satisfactory. He states that they must have reached the coal bunkers, as the sea was covered with black water. In view of the subsequent condition of the "Assai-Chefket," we are obliged to conclude that the water was only blackened by the incomplete combustion of the powder or gun-cotton, an appearance which follows all explosions.

The "Sinope's" torpedo blew the ladder to pieces, but did not harm the Turkish boat. The boat's crew arming themselves with oars and stretchers, engaged in a hand-to-hand fight with their enemy, and

one of them, with a blow with the boathook, hooked on to Lieutenant Pisarefski's overcoat, pulled him over the gunwale of the Russian boat, and with his body half in the water, being already wounded, this Officer was nearly done for, when the revolver shots of the coxswain Zemliakoff, and the carbine of the volunteer Bailikoff saved him, by letting his men pull him out of the water. All this was the affair of a moment.

According to the Russian account, the explosion of the "Navarino's" torpedo destroyed the Turkish boat and heeled over the ironclad; as far as concerning the boat, this may be true; as to the ship, she was simply slightly rolling to port. Anyhow the "Navarino," which, according to Zatzarenni's account was 13 or 16 yards from the explosion, was half filled with water, and she, as well as the "Sinope," ceased to figure in the attack.

Was there any panic on board the Turk? Some men, surprised and frightened, threw themselves into the sea over the bulwarks with "heart-breaking cries," the Russians say; but Ismail Bey, who commanded the "Assai-Chefket," had not served for some years previously in the English Navy for nothing. He made half his men lie down on the deck with their rifles, the guns were cast loose and loaded, and mitrailleuses were in position at the extremities of the upper deck, on the poop, and topgallant forecastle. The approach of the Russian boats had been signalled by the Turkish guard-boats, thanks to the bonfire on the beach, which was put out during the engagement.

We do not wish here to detract from the merit of the Russian Officers, or to throw any shade on their valour, but we want to establish how much the employment of torpedoes, whether spar or towing, is destructive against an adversary on his guard.

Zatzarenni, however, had quickly made out that the second vessel moored near the "Assai-Chefket" was only a little merchant brig, and turning back towards the ironclad, he ordered the "Torpedoist" to renew the attack. A third "wing" torpedo was towed under the "Assai-Chefket," exploded on her starboard side, and caused her to roll briskly; yet again cries of terror were heard, and men throwing themselves overboard. Zatzarenni, who until now had held himself in reserve ahead of the ironclad, between her and the shore, was in doubt whether these cries and the noise did not come from his own friends, and advanced in his turn to help them, and to finish their work. His torpedo arranged, he passed along the starboard side of the monitor and found himself in the middle of a quantity of wreckage, broken water, and men swimming. At this moment the "Assai-Chefket," in rolling, fouled the "Tchesmé," and put her gunwale sufficiently under water to cause her to half fill with water. Everything fetched way on board the "Tchesmé," battery, boat's crew, and all; the torpedo fouled the *débris* of the accommodation ladder, and they were obliged to cut it adrift, the Turks finding it on the shore the next day. The Russians, bruised and blinded, got clear of the side of the ship as best they could. The rifle-fire first stopped; the guns of the "Assai-Chefket" continued, being fired haphazard, their shot passing over the heads of the Russians, who replied with rifle-shots; then the Turkish



ship ceased fire altogether, and the battery alone which was near the bonfire continued a dropping fire.

The Russian torpedo-boats hauled off quickly for the rendezvous, but the "Torpedoist," not turning up immediately, Zatzarenniy went back to look for her on the scene of action, and in the darkness he could only see the masts of the ironclad; he also still heard, he says, "cries" and groans, from all which I concluded that the ironclad was already sinking; as to attacking her again, I could not: my battery was "smashed up."

Not wishing, then, to remain any longer under the enemy's fire, he returned towards Kelasour, and half an hour later he picked up the "Torpedoist." At half-past four the four boats rejoined the "Constantin" at the same place as they had left her.

The day was breaking, and at this moment the navigating Officer fancied that he saw in the mist, masts on the starboard hand. The crew of the "Constantin" set to work, and in seven minutes the four boats were hoisted and the "Constantin" was under full steam. During this time the masts, smoke, and hull of the suspicious ship were passing towards the other side. It turned out to be an ironclad of the "Osmanié" type, which happened to be only three miles off.

As usual, the Russians allowed to no killed and wounded, with the exception of Lieutenant Pisarefski.

Zatzarenniy made a great mistake when he imagined that the "Assai-Chefket" was sinking. He made Makaroff and General Arkas, in whose opinions the ironclad *ought* to have sunk, share in it. In point of fact, she only received trifling damages, and the correspondents of the *Times* and *Standard* boasted of this, and exaggerated the failure of the Russians in saying that three Russian torpedo-boats had been sunk, and the fourth only escaping by flight. According to the account of the Captain of the "Assai-Chefket," one torpedo only could have exploded, but not in contact, and its premature explosion rendered it harmless. We think that this was the case with all three. The Turkish Captain attributes the failure of the attack to the brisk rifle-fire with which he received the boats. On the 31st August the "Assai-Chefket" was at Constantinople. On the 12th September she received orders to cross the Adriatic to the entrance of the Gulf of Arta.

The "Constantin," on her part, returned to Yalta on the 26th August. One cannot refuse to recognise the activity and bravery which Makaroff displayed in this six days' cruise, and of which he had already given proof at Batoum and Sulina.

### *3rd Bombardment of Sulina, 9th-10th October.*

The attack of Sulina was an expedition which had been prepared by the Russians with great care, and the Navy played such an important part in it that we shall ask the reader's leave to exceed for a moment our subject, and to relate the whole affair, especially as we shall observe the action of torpedoes at every step, notably so in the most important incident of the fight.

The Danube empties itself into the Black Sea by three mouths, the

Kilia and St. George, both of which subdivide into a crowd of small channels, and the Sulina, which, on the other hand, has but one. Although this latter only conveys to the sea about the twentieth part of the water of the river, it is the most important, since, in consequence of the International Commission works, the depth there reaches 18 feet, whilst it does not exceed 6 to 10 feet in the other estuaries. In the neighbourhood of Toultscha the river divides into three branches, and its delta forms two large islands: Letti, between the Kilia and Sulina mouths, and Moüh, between the Sulina and St. George mouths. They are extremely swampy, and strictly speaking are nothing but marshes, from which sprout here and there clumps of rushes, whose roots are in the water.

The town of Sulina stretches along the right bank of the river for about a mile from the entrance. Hence it is built on Moüh island, the absence of rushes, which flourish to the westward of the town, leaving to the south-east a large bare plain. In the east part of the town, as well as on the left bank of the river, the International Commission has built warehouses, shops, and stone houses. The rest of the buildings are nearly entirely of wood and of miserable appearance. In going up the river, the average breadth of which is about 220 yards, between the reeds which fringe it right along, are seen the posts and marks indicating the miles from the entrance.

Sulina is accessible from five points:—

1st. From coming down the river.

2nd. From the sea.

3rd. By the sea coast of Letti, round which there is from a village of the same name a strip of firm land, although covered with reeds, about 45 yards broad, within which, however, the soil is impassable.

4th. From the south; on the Moüh Island from Kedriles, a village on the St. George mouth, there is a strip of land analogous to that on Letti; but it is exposed, and consequently easy to defend.

5th. By a canal, narrow and shallow, amongst the rushes which leaves Ivanitza on the St. George mouth, and comes to an end at the back of the town.

At the time of the Russian attack Sulina was protected by three batteries, one on the north shore, situated at 1,600 yards from the watch fire placed at the extremity of the breakwater; a second opposite the first, on the south shore; and a third on the same side as the first, but much further up the river. Abreast of this last, that is a mile and a quarter from the mouth, there were stretched, with an interval between them, two large chains, secured solidly across the river, and a third closed the entrance from the sea. The ironclad "Moukhadem Khair," which could steam 14 knots, defended the first stockade; the other, being under the protection of the ironclads "Medjemi," "Chefket," and the "Mouiné-Zafre," the latter bearing the flag of Mustafa Pacha. Finally, about the middle of September, they had laid down near these obstacles electro-mechanical mines similar to those on the Bosphorus, but which had to be placed on the bottom in consequence of the slight depth of the river. They had even buried some in the banks, and in the neighbourhood of the batteries, and covered them with stones to

act as mitraille. These mines were cylindrical, made of boiler iron, the thickness of the sides being  $\cdot 37$  inch, that of the ends  $\cdot 6$  inch, their length being 5 feet, and diameter 3 feet 3 inches. Three quarters of the interior, about a cubic yard and a quarter, were filled with pebble powder.

Besides the ships already mentioned, the harbour contained the "Kartall" tug, which only drew 3 feet water, and was armed with five small guns, two Armstrong breech-loaders and one Krupp, and two copper guns; the ironclad "Kifzi-Rakhmann," with one 9-inch gun on the forecastle; the "Sulina," an old gunboat, but well armed, carrying five guns, one 20-pounder Krupp placed on the top-gallant forecastle, and four bronze guns, two rifled and two smooth bore, about 30-pounders.

The Turkish garrison consisted of three battalions of infantry and 100 Tcherkesses.

Such, at the beginning of October, was the state of Sulina when the Russians tried to force it.

Resolved upon since July, the expedition was entrusted to Lieutenant-General Verefkine. On the 9th August, a squadron which had assembled at Odessa, arrived at Vilhové on the Kilia mouth, and established itself near the shore before the village of Piriprav, at the end of the Tcherniava arm. One battalion of the 143rd Regiment of Dorogoboujki established itself opposite at Bazartchouk; the two other battalions of the same regiment, the third battery of the 36th Brigade of Artillery, and a sotnia (100 men) of Cossacks occupied the village of Letti, and proceeded to reconnoitre the town. The strip of land along the coast, which the Turkish ships could flank, was considered too exposed for the advance of a column, and everywhere else it was impossible to cross the swamps of the island except with water breast high. Causing then the island Mouh on the right bank of the Sulina mouth to be explored, General Verefkine perceived difficulties of the same class, and resolved only to occupy the villages of Iovantchi, Kedriless, Karadjan, and Karaozman. Finally, he satisfied himself that right along the Sulina arm itself there was no other road, and that beyond the fourth mile-post the bank of the river itself was impracticable owing to the reeds and swamps. Hence, not being master of the sea, General Verefkine was convinced that the only way of getting at Sulina was to use the channel itself, and that the principal attack must be entrusted to the Navy, and that the troops must aid by a diversion. It was decided that the expedition entering the Danube by the Kilia mouth should ascend the stream to the head of the delta, and come down again by the Sulina arm to attack the town.

New ships, and their equipment, were hurried on by the ports of Odessa and Nicolaieff, and on the 5th October the flotilla, under the command of Commander Dikoff, was at last ready for action.

Its composition and armament was:—

1st. Screw gunboat "Voronn," three 6·2-inch mortars and two 9-pounders.

2nd. Screw gunboat "Outka," three 6·2-inch mortars and two 4-pounders.



3rd. Screw gunboat "Lebedi," three 6·2-inch mortars, one 3-pounder, and two 4-pounders.

4th. A wooden barge, carrying two 6·2-inch mortars, and a 9-pounder.

5th and 6th. Two steam tugs, "Opyt" and "Sestritza," each with two 4-pounders and a howitzer.

These six ships were commanded by Commanders.

Finally, seven torpedo-boats, of which one, fitted out by the Odessa Yacht Club, bore the name of "Lieutenant Poustchine," and were commanded by five Lieutenants, a Sub-Lieutenant, and a Midshipman. Besides these a hired wooden barge served for a pontoon, and another for a powder and shell magazine.

The flotilla, in which the Moldavian flag was joined to the Russian, had received 90 torpedoes and 75 gun-cotton rockets, for which the boats could carry two travelling troughs and two boats' tubes.

On the morning of the 5th October, under the orders of General Verefkine, the flotilla weighed from Vilkové, embarked at Bazartchouk three companies of Dorogoboujki's regiment, ascended the river as far as Toultscha, which is at the head of the Danube delta, and thence descended back again, down the "Sulina" arm. It landed a company at the sixteenth mile-post to occupy on the right bank the village of Karaozman, then stationed itself in front of a line of torpedoes which had been previously established by the Russians near the twelfth mile-post.

This operation, which ought to have been completed on the 6th, was delayed by the badness of the weather, the slowness of the ships, and was only finished on the evening of the 8th; it cost the Russians the loss of the torpedo-boat "Lieutenant Poustchine," which, on the 7th, when going full speed, touched and sunk. It was decidedly an unlucky name.

Whilst this delay was occurring, General Salatzki, who commanded the troops on the Letti Island, and who was counting on an earlier arrival of the squadron, had sent off, on the evening of the 7th, by a footpath tracked beforehand through the reeds, and near that by the border of the sea, a detachment of blue jackets and a rocket party, commanded by Midshipman Drijenko, which he caused to be supported by a column in his rear. The detachment, after inexpressible fatigues, was able to arrive near the Turkish outposts, but made no attempt to attack, owing to the non-arrival of the ships. Discovered on the afternoon of the 8th, they were driven out by the Turks, experienced heavy loss, and only saved themselves with great difficulty. The commander of the flotilla, Dikoff, having arrived at the twelfth mile-post, wished, before going further, to lay down near Sulina itself a new line of electro-contact torpedoes, which should close the river to the Turks and permit the Russian ships to approach the town in safety. The senior Lieutenant, Krouskopff, who commanded boat No. 8, was charged with the execution of this duty, with five boats, whilst Sub-Lieutenant Strogonoff, with the boat "Vikhio," of which he was the owner, was sent as guard boat.

This little expedition started at six in the evening; Krouskopff's boat towed two launches, carrying 30 chasseurs of Dorogoboujki's

regiment, intended to dislodge the Turkish outposts, should they be found troublesome, near the second mile-post. The other boats each towed a "loftcha," a little native boat, carrying two mines. At the same time, Verefkine sent along the right bank of the river 60 chasseurs, to help on this side the operations of the torpedo party at the second mile, but the difficulties of the country prevented their passing the fifth mile.

After having placed his mines, Krouskopff was to await the fleet between the third and fourth mile, to point out their anchorage to them; it was supposed, in fact, that the work would be finished by one in the morning, and that the flotilla would be able to post themselves by day-break in their stations for action.

But they had not reckoned on the intense darkness of the night; the boats, firstly, lost much time in looking for a good place to land the troops. Then, passing the second mile mark, they got too close to the outer chain placed by the enemy, and were observed by the Turks; hauling off with difficulty, for they then had to tow their "loftchas" up stream, they at last succeeded in anchoring in the bend of the river nearest Sulina, and laid down their mines, but they were much disturbed by fire of case and musketry. Although this was the first occasion that this Russian force had been under fire, the torpedoes were anchored with care; unfortunately the boat which Midshipman Radetzki was towing carried away its painter, and the "loftcha," its two mines and a seaman were swept away by the current and thrown on shore, about three-quarters of a mile from the outer Turkish stockade. The Russians evidently dared not try to rescue them, and they fell into the hands of the enemy, except the man, who jumped overboard, reached the reeds, and was picked up by the chasseurs. Another "loftcha" also carried away its tow, but being daybreak, the Russians were able to save it, the Turks, as usual, being too slow.

At 6 A.M. on the 9th October, Dikoff was informed that the mines were placed successfully. Embarked in the "Voronn," he immediately descended the river to take up his station for action, which operation he had intended to perform during the night. On arriving at the sixth mile, he sent the "Opyt" on ahead, she being provided with an arrangement for picking up mines. Seeing this, the Turkish ironclad "Khifzi-Rakhmann" made the signal for action, and the "Kartall" stood towards the Russians. Thanks to her small draught of water, she crossed unharmed, the line of the enemy's mines opened a murderous fire of case on the chasseurs and the boats amongst the reeds, and even sent boats after them, which were, according to the Russian accounts, compelled to retreat precipitately. Then, seeing all the Russian divisions within three miles of her, she called the "Salina" to her aid. On his side, Dikoff, seeing the dangerous predicament of the chasseurs, entrapped between the river and the marshes, recalled the "Opyt," and advanced himself with the "Voronn," followed by the "Outka" and the "Lebedi." The action was thus becoming lively.

It was the first day of the feast of Bairam. All the Turkish ships

were dressed with masthead flags. Whilst the "Kartall" steamed up the river along the south shore, the "Sulina," which had got under weigh at 7.45, followed the north shore, and fired on the Russians. Suddenly, at 8.10, as she was passing the little bend in the river, she struck with her starboard bow one of the Russia line of torpedoes; a column of water was raised, and, in a few minutes, she was at the bottom, her four flags indicating from afar the scene of the disaster. She sunk across the river, her bow being 30 yards from the north shore, with water over her deck nearly to the bridge; the foremast, though carried away, had not fallen, but the maintop-mast had come down. The guns forward, and the Krupp on the forecastle, were thrown out of their carriages into the water, and a boiler blew up a few moments after the explosion. As to her crew, the Second Lieutenant of the "Sulina," who was on the forecastle, was killed; the Second Lieutenant of the "Moukhadem-Khair," who was on the bridge with the Captain of the "Sulina," was thrown down the hatchway and wounded so badly that he died the next day; five men were badly burnt or wounded, six were missing, and the rest of the crew saved themselves by swimming and were picked up by the "Kartall," who came to the rescue of the "Sulina." The Turkish Captain abandoned the masthead flags, in order, as he said, to obtain help sooner for the Second Lieutenant of the "Moukhadem-Khair."

The "Kartall" immediately returned to Sulina with the remains of the crew of the "Sulina," and the "Khifzi-Rakhmann," who was following the latter ship, stood on. Suddenly, instead of closing with the enemy, as had been her intention, she stopped inside the line of the enemy's torpedoes. The Russian flotilla took station about 8.30 A.M., between the third and fourth miles, and at the enormous distance of 6,000 yards a cannonade was commenced between them and the ironclad "Khifzi-Rakhmann," which the shore battery assisted in, and which the "Moukhadem-Khair" was not long in taking up. But the shot from this latter fell 500 or 600 yards short of the nearest Russian, because her ports and carriages would only allow of an elevation for 4,000 yards range. The shells from the bow gun of the "Khifzi-Rakhmann," on the contrary, burst nearer and nearer to the enemy's ships, and one of them, having only just failed to reach the "Voronn," Dikoff hauled off a little, as his own shell were often passing their mark.

At 1 P.M. a thick fog got up, and the Russian flotilla, ceasing action, withdrew to the fifth mile.

At 1.50 P.M. a Russian column, coming from Letti, appeared. With great trouble they had managed to get up, avoiding the path by the beach. They established a rocket battery 1,600 yards from the Turkish battery on the north shore. To this tardy attack, which had been intended to divert attention from the main river attack, the Turks replied by sending a column of marines, and the "Mouini-Zafie," which, steaming up the shore, took the Russians in flank. The latter contented themselves with firing nine rockets, of which one fell on the right bank, in front of a house belonging to the International Commission, and then retired, having had two men wounded.



From the same side, on the Letti Island, the Russians made two reconnaissances during the night, and on the morning of the 10th, the first being by Cossacks and the second by two companies dragging two field-pieces. This latter, timidly sent off at 6 A.M., was repulsed by the combined fires of the shore battery on the left bank and of the ironclads "Mouini-Zafie" and "Medjemi-Chefhet." The 9th closed quietly on the river. The Turks had only had one man touched by the fire of the enemy, but the blowing up of the "Sulina" had cost them a heavy loss. During the night the "Khifzi-Rakhmann" and the "Moukhadem-Khair" shifted berth a little down the river, for fear of a night attack. The night was exceedingly dark until daybreak, and a beating rain never ceased falling, driven by a fresh breeze. There was nothing to fear either from seaward or from the river.

As a whole, the affair of the 9th, in spite of the blowing up of the "Sulina," was a failure for the Russians. They hoped to carry Sulina by a smart attack, and they had not succeeded; and in the evening Verefkine received telegraphic orders to cease the attack on Sulina, and to content himself with engaging the ironclads. For the greater safety of the fleet, he had placed, during the night, a fresh line of electro-mechanical torpedoes higher up than the previous one. This was carried out successfully, without the men being seen or disturbed by the enemy. The defence of this line was entrusted to a detachment of infantry situated in the marshes, and supported by steam launches.

The morning of the 10th October, the weather had cleared up, Dikoff advanced his flotilla to their stations of the day before, by the fifth mile mark; in rear, by the eighth mile, was the barge used as powder magazine, to which the steam launches went to and fro.

When the Russians perceived that the ironclads had dropped back, they let themselves drift a little, and opened fire about 7.30 A.M., at 5,800 yards, on the "Moukhadem-Khair" and the "Khifzi-Rakhmann." At 9.30 the latter was struck in the boilers, and obliged to retire to the roadstead near to the "Mouini-Zafie." The shot was fired from the "Voron," and had been fired in the presence of General Verefkine, who congratulated the gunners, and gave the captains of the guns a pecuniary reward.

Still drifting down, the flotilla was able to advance as far as its own second line of torpedoes, in order to engage more effectually the "Moukhadem-Khair," which remained henceforth alone, and was making very bad shooting, all her shot going to the right. Finally, this ironclad, which the "Mouini-Zafie" came for a moment to support, retired behind the cross jetty, a mole of the port of Sulina, built of the ballast from ships, and there, if she ceased her own fire, was completely sheltered from the fire of the enemy. Two steamers and the floating battery came down and anchored about the third mile, but they were still 4,800 yards from the "Moukhadem-Khair," thus the fire from their 6.2 inch guns was uncertain. However, many of their projectiles burst under the bows of the ironclad, and one wounded a sailor on the forecastle. But this was all. Elsewhere, the town received 30 out of the 200 shots fired by the enemy, and suffered con-

siderably. The buildings of the International Commission, built near the shore, and beyond the range of the Russian pieces were, however, not touched.

After her retreat, the "Moukhadem-Khair" fired a few rounds during the afternoon; the battery on the right bank ceased fire, their guns, like those of the ironclad, not having sufficient range.

The Turks suffered very slightly, one gunner was wounded in consequence of a miss-fire. The next day they found, in the outskirts of the town, a lot of shells, whose fuses had not acted, or with not sufficient effect to ignite the bursting charge.

As to the Russians, who had a fair field, they dared not approach the Turkish obstacles to destroy them. Satisfied with having silenced the enemy's fire, they ceased firing at 4 P.M., and withdrew to the fifth mile.

The night of the 10th was as windy and rainy as the preceding one. On the 11th, at 7 A.M., the fusilade recommenced from the left bank; during the night the Russians had concentrated on this site at two miles from the town, three companies of infantry and a rocket detachment, and fired, at 2,000 yards, several rounds from their field pieces. The Turks did not reply to this. The Russians subsequently declared themselves very dissatisfied with their gun-cotton shell rockets. They were very unsteady, and one, bursting near the trough, wounded several men and broke a rifle. This sort was not employed on the river.

This demonstration was the last. All the day of the 11th and the succeeding night was fearful weather; the Russians never dreamt of repeating the attack. The Czar sent them his "thanks," and, at the same time, the Minister for War wrote, recommending them to be careful and to spare the building of the International Commission. Vereffine read this as directing him to cease all offensive operations, as it was impossible to get at the ironclads without damaging the town. Satisfied with the results attained, meagre as they were, he ordered Dikoff to withdraw the flotilla.

The Russians allow to two killed and three wounded in their operations on the river.

During the night, Dikoff had a torpedo placed under the sunken ship, the explosion of which destroyed her completely; the Turks fired a few shots. The operation had been entrusted to Lieutenants Fridrick and Skriaguine and Sub-Lieutenant Stragonoff, who carried off the flags from the mastheads.

On the evening of the 11th they left for Nicolaïeff; although Dikoff subsequently received the Cross of St. George (4th Class), and Kionkoff, Fridrick, &c., that of Vladimir, it is curious that they were all relieved of their commands after the affairs of the 9th and 10th October.

To have been successful, the Russian attack on Sulina should have been conducted in a much more vigorous manner; the adversaries remained separated by two stockades and two lines of torpedoes, which ought to have been forced if they wished to arrive at any result, which not being done, was impossible to obtain.

Dikoff understood this thoroughly. "According to my ideas," says he, "it was only possible to get rid of the Turkish squadron by attacking them with torpedo-boats, prepared beforehand for decisive action. But before sending these out, it was necessary to silence the battery on the right bank, armed with eight smooth-bores, whose fire was more dangerous than that of the heavier guns of the four ironclads. Without extraordinary luck, our bombardment could not effect this, since our ships were stationed close to a line of torpedoes, placed on the night of the 9th October, beyond which it was impossible to engage the ironclads moored near the moles of Sulina  $1\frac{1}{2}$  miles from the west of the town, and  $2\frac{3}{4}$  miles from the positions of our ships. To have continued the bombardment it was necessary to destroy our line of torpedoes, sweep for the Turkish torpedoes placed near the river obstacles, destroy these obstructions, and pass with our flotilla into the port of Sulina itself, where it would have been possible to destroy the second fort on the right bank, and engage the ironclads. It is true that between them and us there should not have been the obstacles which protected us, and the Turkish Admiral should not have permitted us to fire with impunity on his ships."

We have seen that the Turks had seized two torpedoes carried off by the current with the raft which carried them. A description of these torpedoes has been given in the *Army and Navy Gazette*.<sup>1</sup>

#### *4th. Night affair of 27th and 28th December, 1877.*

In describing this affair in our previous number, we wrongly imagined that the "wing torpedoes," which the boats were preparing to use when rejoining the "Constantin," were an early pattern of Whitehead. They were simply towing torpedoes of the same class as were used by Zatzarennyi at Batoum, Sulina, and Soukhoun.

Here are some further details to our previous account of the Batoum affair.

The "Tchesmé" carried her discharging tube under her keel and cast it adrift when steaming for the "Constantin," the "Sinope" carried hers on a raft.

The "Tchesmé's" Whitehead exploded between the fore and main masts, and the column of water did not reach half way up the side of the ship. There was, therefore, little effect. We suppose that it never touched the ship, but a rock on the bank near which she was moored.

As to that of the "Sinope," we believe, from General Arkas's first telegram, that it never exploded at all.

#### *Night affair of 25th and 26th January, 1878.*

On the 22nd January, 1878, the Commander-in-Chief of the fleet and harbours of the Black Sea ordered by telegram Makaroff in the "Constantin" (now become Captain) to cruise along the east coast of the Black Sea, and to make a demonstration against Batoum.

<sup>1</sup> It will be of interest to naval Officers to know that the defence of Sulina was planned, and the forts built, and torpedoes laid down, by two late English naval Officers, Captain Manthorpe and Lieutenant Sleeman.—(Translator.)



On the same evening Makaroff sailed from Sebastopol, carrying under his davits two torpedo-boats, armed with Whitehead torpedoes, and experiencing during the night a strong breeze from south-west, which veered to north-east in the morning and blew very hard.

The "Constantin" rolled so heavily that her boats dipped in the water; but, however, thanks to the care with which they were secured, they sustained no damage, and on the evening of the 24th the steamer arrived at Soukhoum. Although the wind had gone down, a heavy swell remained, and did not permit them for some time to approach the enemy's coasts.

The 25th January, in the evening, the swell had gone down considerably, and the "Constantin" steered for Poti, where Makaroff learnt that the whole Turkish fleet was at Batoum. He resolved to attack them immediately, started off, and when four or five miles from the place started off his two Whitehead torpedo-boats, the "Tchesmé," commanded by our old friend Zatzarenni, and the "Sinope," under the orders of Lieutenant Stetreckenski, who had already taken part in the affair of the 26th December.

The command of the expedition was, as usual, given to Zatzarenni.

The boats left the ship at 11.20, and steered in the direction indicated by Makaroff; but a slight fog and the snow which covered the mountains, altering the appearance of the coast, Zatzarenni went backwards and forwards, and it was not until 1.30 that he entered the roads of Batoum from the north. The moon was rising behind the hills, and about two o'clock she shone brightly on the squadron, and on the enemy's port. The picture was striking; the reflection of the moon's rays from the snow on the mountains gave everything a singular brilliancy. At the entrance of the bay was a guard-ship, which was lying broadside on to the right of the lighthouse; then they could see the white buildings of the town, lighted up by the moon, the battery on the point on which the lighthouse stands, and seven ships, moored stern to shore, as is usual at Batoum. There was a two-masted steamer, with white paddles, two three-masted ironclads, a steamer with large paddle-boxes, and a little further towards the foot of the bay three large ships whose masts could not be clearly seen. The Russian expedition was then one mile from the squadron and half a mile from the guard-ship.

Approaching the latter, Zatzarenni made her out to be a man-of-war of 1,200 or 1,300 tons, with a bowsprit prolonged to a point beyond the jib, with yards on her foremast, and six boats hoisted up to her davits.

Going very gently the boats approached to from 70 to 90 yards from the ship, and at this distance Zatzarenni fired his Whitehead at the starboard side at the mainmast. At the same instant Stetreckenski let go his a little more to the right. On the explosion, the two torpedoes threw up a mass of black water as high as half way up the masts. They heard a fearful smashing, and the hull of the ship, *at the end of a minute*, disappeared entirely beneath the water; the next minute the masts had disappeared, a circle of wreckage, pretty regularly shaped, alone marked the scene of the catastrophe. It is unneces-

sary to add that the Russians, by their hurrahs, apprised the enemy that their guard-ship was sunk.

The bay, a moment before so tranquil, was reverberating with the cries of the Turks, who were swimming about, or holding on to floating objects. Zatzarenni says that he wanted to go and help these unfortunates, but that the boat's screw getting foul every moment of the débris, he hastened to regain a less dangerous situation, and he turned his head to the "Constantin." Smoke was shortly seen from a steamer, or some boats going to the assistance of the men in the water; then a battery on shore fired some shots. Ten or fifteen minutes afterwards they saw signal lights on the scene of the disaster; one ship stood out to sea. At 2.45 the Turks lit up again the light at Batoum. During all this the boats arrived alongside the "Constantin" at 3.15, and were hoisted up immediately. Having thus fulfilled his instructions, Makaroff appeared on the morning of the 27th off Samsoun, and, standing along the coast, returned to Novorossisk and anchored at Sebastopol on the night of the 28th January. After this last expedition Makaroff was made Aide-de-Camp to the Czar, Zatzarenni a Commander, and Stetreckenski decorated with the Cross of St. George (4th class).

We will not prolong this account and repeat the orders of the day of the General Admiral, the Grand Duke Constantine, or the Commander-in-Chief of the Black Sea fleet; but it would be difficult to find more pompous dithyrambics than the hymns of praise addressed to all the Officers of the "Constantin." On our part, we recognise willingly that they showed themselves to be brave and intelligent men. Anyway, if the attempt of the 26th December totally failed, that of the 26th January succeeded. That appears to be beyond question.

The nine occasions which we have described constitute the most important affairs in which, during this war, the torpedoes played a part.

Nearly all species of these weapons have been tried. Spar and Whitehead torpedoes have shown their offensive value, electro-mechanical mines their defensive value; but in face of the numerous failures of the Russians it will be perceived that a ship at anchor, with a good look-out, has a great chance of escape even from opponents as resolute as Zatzarenni has showed himself. The Whitehead has introduced, it is true, a new element into the question; it will be necessary, as in the new army tactics, to have alert outposts, active picquets which will arrest any surprise from enemies operating at a distance.

As to the correct defence of ships against torpedo-boats the solution is difficult; but the chief complication of the problem is, that in time of war a man-of-war should be ready to get under weigh at any moment. We think that the question does not admit of a general solution; each particular case must be decided separately. Nets appears to us to be as useless as cumbrous, and we think that the protection ought to be independent of the ship. This would not refer to counter-attacks by torpedoes to assailants which can be seen approaching.

## MILITARY RAILWAY-TRANSPORT IN FRANCE.

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It is unnecessary in these days to dwell upon the necessity for framing, during peace time, an organization and regulations by means of which a State may at once be enabled to reap the maximum amount of advantage derivable from the use of its railways, on the outbreak and during the continuance of war. These advantages have of late years been fully discussed by many able writers, and it may be assumed that the student of military subjects is well acquainted with them. Nevertheless, as an introduction to the subject of this paper, it may be as well to recapitulate them under a few general heads.

First, there is the mobilization of the troops—a period during which small bodies, and even individual soldiers, are travelling independently towards their appointed stations over every railway in the country, when little or no interference with the ordinary traffic arrangements is necessary. Next, there is the transport of the mobilized army corps towards the points selected for the concentration of the forces, during which period certain of the railways involved must be entirely devoted to military uses, all other traffic being either completely suspended or allowed only under the strictest limitation for meeting obvious necessities. When the concentration is completed, the lines leading to the theatre of war are used for conveying to the army its needful supplies both of food and war material, as well as reinforcements of men and horses to meet the waste of warfare; and for removing from the army all its incumbrances, its sick and wounded, prisoners of war, superfluous or unserviceable war material, trophies taken from the enemy, &c.

In addition to the uses already mentioned, there are others to which railways are applied incidentally as circumstances dictate during the progress of the operations, such as the transfer of troops from one scene of operation to another, and the rapid transmission of reinforcements to critical points even during the progress of a battle.

Thus, when large operations are undertaken, there is a continuous stream of military traffic absorbing the greater part of, if not all, the working capacity of these lines, and necessitating an exclusively military control over at least a large section of each line connecting the base with the theatre of war.

Experience has shown that the broad principles upon which this control is best exercised are, first, the division of the management of a railway into two parts—by appointing a transition station, between which



and the terminal stations near the army in the field, military authority shall be paramount during the whole of the operations, the other part of the line, namely, that on the homeward side of the transition station, remaining under the control of its ordinary directors assisted by a military staff with reference to matters connected with military transport. And, secondly, as regards the portion under military control, the maintenance, to the utmost extent practicable, of the existing system under which the traffic of each line is conducted, retaining the services of the working staff and operatives, supplementing them to such an extent as may be necessary, and placing over them military Staff Officers who, while dictating the services required and ensuring their actual performance by personal supervision, shall at the same time interfere as little as possible in technical details. It is absolutely necessary that the Officers so employed shall have complete control over, and be entirely responsible for, the proper working of the lines, or sections of lines, over which they are placed; competent railway engineers and other skilled officials are therefore appointed as their assistants in all technical matters.

At the commencement of the war in 1870, France had no organized system for conducting military railway-transport. A scheme for such an organization had indeed been prepared a year or two before in great detail, through the efforts of Marshal Niel, but it had never come into operation, nor does it appear that the Army generally was aware that any such steps had been taken. When the war broke out, the railway companies received orders and requisitions from a host of military authorities, independent one of the other; these orders were often of a contradictory or impossible nature, and the greatest confusion was the consequence.

The object of this paper, however, is not to relate the failures and shortcomings of the past, but to give a general sketch of the system of railway organization and the code of regulations now existing in France, for the management of military transport for strategical operations; these were mainly prepared by the Military Railway Commission, which was assembled under the presidency of General Saget, in the latter part of the year 1872. The regulations bear the date 1st July, 1874, but are modified by the Decree of the 27th January, 1877; the latest edition being that of 1878. The entire code is divided into two distinct parts—one dealing with the ordinary transport of troops during peace, the other with transport for strategical operations; it is with the latter only that we are at present concerned.

All questions relating to the use of railways by the Army are dealt with by the Superior Military Railway Commission permanently established at the War Ministry, the composition of which is as follows, viz.:—

President.—A General of Division.

Vice-President.—A General of Brigade.

The civil members, nominated by the Minister of Public Works, are, a superior functionary from that Ministry, and two delegates from the syndicate of the railway companies.

The military members, nominated by the Minister of War, are, a

Field Officer of the Staff, a Field Officer of Artillery, and a Field Officer of Engineers, for matters special to their respective services; a functionary of the Intendance; a *chef d'escadron* of the Staff, as secretary and adviser with respect to movements of men and material; and a superior Officer of the Navy.

In connection with each of the six great railway companies of France, a Commission of Study is instituted composed of a Field Officer of the Staff and a superior functionary of the railway company; their duty is to make themselves masters of all details connected with the line, and prepare schemes for the movements of troops thereon under every eventuality that may arise, having reference to mobilization and concentration for strategical purposes. The minor railways are for these purposes considered as attached to one or other of the six great companies. The following are the principal points which these Commissions have to consider:—

The choice of the routes which shall be followed under each of the several conditions contemplated.

The number of trains which can be forwarded in a day according to the working capabilities of the line and other circumstances.

The number of engines, and amounts of rolling stock required.

The selection and preparation of stations for departures, arrivals, and for the halt of troops on their journey.

Twice a year they render to the Superior Commission reports embodying the results of their labours, which are examined, modified when necessary, and preserved for use. In addition to these reports the military member of each Commission, with the assistance of the Staff of the Army Corps, and the recruiting authorities, is required to render an annual statistical statement showing all details connected with the movements by rail of men in the reserves and men at the disposal of the active Army, who would be required to join on mobilization, and also marches which must be performed concurrently with the railway journeys so as to accelerate a general movement. These, although prepared by the military member, are examined by both members jointly before being transmitted to the Superior Commission at the War Office.

In all these matters they are guided by instructions, both general and special, emanating from the Superior Commission, which in its turn receives general directions concerning the more important questions from the Minister of War; and when necessary the Commissions of Study are brought together or grouped, as may be found convenient, so as to ensure a perfect co-operation and agreement in their schemes.

For strategical operations it is the duty of the Superior Commission to select for each line of railway transition-stations, at which the working of the lines shall cease to be under the management of the railway companies, and from which towards the Army the entire control shall be in the hands of the military authorities. They are also to determine magazine-stations at which shall be created magazines of the first, second, or third class, where shall be collected war material, and provisions for the supply of the armies on taking the

field, magazines of the first class being as far as possible established either in fortresses or under the protection of their guns.

When troops have to be transported by railway for strategic purposes the Superior Commission exercises the very extensive powers conferred upon it by the decree of the 14th November, 1872. It is authorized to delegate its powers, either wholly or in part, to an Executive Commission, composed of two of its members, one being the President or the Vice-President, the other a member possessing the requisite technical knowledge; a third member may also be added at discretion. These are nominated by the Commission itself, which also determines the extent and duration of the powers thus delegated.

During strategic operations involving railway-transport, the Superior Commission sits permanently at the War Ministry, its *personnel* being augmented as may be found necessary; it constitutes the sole channel of communication between the War Minister and the territorial authorities on the one hand, and the chief administrative authorities of the railway companies on the other.

When mobilization is ordered, the Superior Commission immediately warns the railway companies to proceed with the execution of the schemes already planned for the transport of the men in reserve and at disposal. At the same time the Commissions of Study are transformed into Line Commissions for the railways with which they have been connected, their sphere of action and residence being defined by the Superior Commission according to the work to be performed, and subordinate assistance being provided from the territorial army. They continue to act as the agents of the Superior Commission, to whom they report and from whom they receive all their instructions. All the necessary particulars for their guidance are furnished to them from the documents previously prepared, and they are entitled to claim the assistance of the Army Corps Staff Officers who, in each region, regulate the movements of troops by rail. A daily report is rendered by them to the Superior Commission.

When the concentration of the forces is contemplated, the Superior Commission gives timely warning to the railway companies to collect their rolling stock, and to take all other necessary steps; when these involve any expenditure by the companies, these orders guarantee that it will be defrayed by the War Ministry. At the same time it furnishes the War Minister's Staff with tables of the transport service, upon which are based the orders which the troops must receive for the movement.

The Line Commissions are placed in possession of the prepared tables affecting their sphere of operations, and it is their duty to ascertain that the companies have given the proper orders to their subordinates, and that the Commanders of the troops are in possession of their orders for the movement; this latter information is obtained by communication with the Staff of the corps concerned.

For this purpose, to each of the stations which have been previously selected on the several lines by the Superior Commission, a Route-Station Commission (*Commission d'Etapes*) is appointed, composed of a Field Officer or Captain, a railway functionary as



the technical agent or station-master, and at stations where the troops are to halt for meals, an Officer of the Intendance with subordinate assistance is furnished from the ranks of the territorial army.

In every Army Corps region, the requisite *personnel* for these Commissions is nominated beforehand, and the order for mobilization specifies which of them shall at once enter upon their duties. The Route-Station Commission is furnished with an extract from the previously prepared tables of transport already mentioned, containing all details with which it is concerned; it receives its orders from the Line Commission, or, under very urgent circumstances, direct from the Superior Commission. It regulates all local arrangements necessary for the execution of the general plans for railway transport service; takes the necessary steps for ensuring the issue of food, the comfort of the sick and wounded, and, in concert with other authorities, the provision of quarters for troops on their passage.

In the execution of these duties, although united in one body for the purpose of securing co-operation, each member of the Commission is responsible for the services specially appertaining to his position. The military member is placed in the position of a Commandant, to whose instructions all who come within the area of his command must conform, whatever may be their rank; his principal duties are the following:—

He maintains strict order at and around the station, allowing only such troops as can be immediately conducted to their platforms to enter it; he prepares all military details connected with the operation of entraining, so that, on the arrival of the troops and material, he may at once indicate to their commander the platforms to be used and the allotments of the carriages and trucks; he personally sees that these allotments are strictly observed. It is his duty previously to ascertain from the local military commander that the troops about to proceed are in possession of the proper orders. He assembles all individual soldiers arriving at his station for passage, marshals them in groups suitable to the trains they are to enter, and marches them to their proper platforms. He makes provision for the orderly formation of all troops and material detraining, and the clearance of the platforms and station as rapidly as possible. To assist him in this, he is informed daily by the local military authorities of the destination of each body of troops expected during the next twenty-four hours, whether they are at once to proceed by march route or to await further orders, &c. When trains halt at his station for any purpose, and especially when it is to enable the troops to take a meal, he takes care that all necessary preparations are complete before the arrival of the train, and is present at every arrival and every departure.

The railway technical member, or station-master, is, on the other hand, solely responsible for the movement of trains, and their production at the proper platforms at the prescribed hours according to the time-tables or other special orders received, and for the execution by the railway agents and operatives under his control of all duties connected with the technical service of the line at his station. In

all matters connected with the maintenance of order and regularity, such as the erection of barriers, the opening and closing of doors and of refreshment-rooms, &c., it is his duty to conform to the requirements of the military member.

These two members jointly prepare a diary of all proceedings at the station, and a daily report, with extracts therefrom, is transmitted to the Line Commission. The Officer of the Intendance provides for the supply of the troops, under definite instructions on this head received from his superiors.

In the performance of their duties the Superior Commission, the Line Commission, and the Route-Station Commission, each enjoy the free use of the telegraphs, whether belonging to the State or to the railway companies, priority being given to matters relating to the running of the trains.

If, from any cause whatever, a body of troops cannot proceed by the train allotted to it, reference is at once made by telegraph to the Superior Commission, who issue instructions on the subject, so that the general plans may not be disarranged by partial action.

The Superior Commission, in accordance with the general plan, and with reference to the existing magazines and other local circumstances, determines for each Army Corps region, a station of departure (*gare point de départ d'étapes*), to which is appointed a Route-Station Commission, whence are despatched all persons and *matériel* to be conveyed from the region to the Army Corps which has occupied it; the *personnel* being consigned to the *transition station*, and the *matériel* to the *magazine station*. On the other hand, all persons and *matériel* sent back from the Army Corps, and destined for any place within the region, are consigned to the station of departure, and thence distributed through the agency of the Route-Station Commission.

From the moment that the Minister of Public Works notifies to the railway companies that they are required to place all their means of transport at the disposal of the War Minister, the necessary steps are taken for clearing the line of ordinary traffic. Trains *en route* continue their journeys, discharge their loads, and the empty carriages are despatched to the station from which the military trains are to start. The public is advised of the state of affairs by placards on all the lines concerned, and station-masters warn the owners to remove merchandise awaiting despatch or delivery.

Stations specified as points of departure, arrival, or as halting places for the troops, receive, when necessary, an addition to their staffs; appliances suitable to the service to be performed are provided, such as stages for loading and unloading, additional lighting and telegraphic apparatus, casks and buckets for watering horses, &c., and the execution of such constructions at the stations or along the lines, as have been determined by the Superior Commission, are at once proceeded with.

The foregoing arrangements refer to transport on the home side of the transition station; we now come to the system of conducting the traffic beyond that station.

At the head-quarters of the Army is established a Field-railway

Direction (*Direction des Chemins de Fer de Campagne*) consisting of a General Officer, or Colonel, and a railway engineer; the former, whose authority is supreme, has under his orders a Field Officer of Engineers, a Field Officer of Artillery, an Officer of the Intendance, and other Officers of different branches of the service; also railway officials, in number proportioned to the magnitude of the operations; a Chief Paymaster is also attached to the Commission; its *personnel* is nominated beforehand on the recommendation of the Superior Military Railway Commission.

The Field-railway Direction receives its instructions directly from the chief of the staff of the Army, and controls all railway transport between the transition station and the different fractions of the armies in the field, its subordinate agencies being Military Field-railway Commissions, each exercising its functions within such limits as may be assigned to it, and the Field-railway Route-service commands, established at the principal stations on these sections.

To ensure co-operation with the authorities governing the railways within the base of operations, the Field-railway Direction is in daily communication with the Superior Commission at the War Ministry, and also with the Route-Station Commission established at the transition station, which latter, as a general rule, receives its instructions from the authorities within the base, but under urgent circumstances must conform to the orders of the Field-railway Direction.

The principal subjects upon which correspondence takes place between these two separate authorities are the following:—

The transfer of railway *personnel* and *matériel* from one sphere of action to some other, either permanently or temporarily; the interchanges of the time-tables established by each within its own network; daily information concerning transport consigned by each to the transition stations; matters concerning trains echeloned along the lines as magazine trains; and the alteration of the transition station either forwards or backwards, with the modifications thereby caused in the working of the lines. This last step requires the personal approval of the Commander-in-Chief.

The Field-railway Commissions are composed of a Field Officer as President, whose authority is paramount; an Engineer Officer in command of the railway-troops allotted to the district; an Officer of the Intendance; and a railway engineer; a Paymaster is also attached to it. In peace time three such Commissions are maintained complete in their *personnel*, each of which assembles annually for at least a fortnight, for the study of some portion of the French railway network indicated by the Superior Commission at the War Ministry.

The executive agents for working and maintaining the field railways consist of detachments of the railway workmen belonging to the Engineers, supplemented by railway operatives taken from among such employés of the railway companies as are liable to military service. The requisite rolling stock and other material is supplied by the railway companies on the requisition of the Superior Commission acting on the information of the Field-railway Direction.



The Field-railway Commissions are entirely under the control of the Field-railway Direction; they are charged with the execution of all works connected with the construction, repair, and maintenance, as well as the destruction of the lines and structures connected therewith; the selection and establishment of suitable stations for army transport purposes; the entire train service; the military protection of the lines, buildings, and trains; and in general, the duties connected with the route-service within their sections, with reference to all detachments and individuals passing to or from the Army. Each of these Commissions has allotted to it a detachment of *gendarmerie*, for the police duties of the stations and trains, subordinates for office duties, and sufficient troops for the protection of the lines and trains.

At each of the principal stations within the sections controlled by these Commissions, is established a military route-service command. The commandant is a military Officer, having, as his assistants, a station-master, taken either from the special railway troops or from the employés of the railway companies liable to military service; an Officer of the Intendance, when necessary; and an accountant. In each Army Corps province the *personnel* for two such commands is designated beforehand; in war time they constitute the local agencies by means of which the Field-railway Commissions carry out their duties.

The station commandant receives all his orders from the Commission within whose section he is located, and exercises the chief control at his own station; he is furnished with a detachment of troops, and, when necessary, of *gendarmerie* also, and the necessary clerical assistance for his office.

As a general principle, the details of the work connected with transport beyond the base of operations must be carried out in conformity with the regulations for ordinary transport, in so far as they are applicable, all private traffic, however, being as a rule excluded from the lines. The railway companies are forbidden to accept for transport to the transition station, or to any station beyond it, any property not belonging to the military service, except with the express sanction of the Superior Commission.

On each of the railways leading directly to the Army in the field, the military railway direction appoints one or more terminal field stations (*stations têtes d'étapes de guerre*), selected on account of the facilities they afford for the reception and distribution of supplies for the Army and the retransmission of what it is desirable to remove; each of these stations is allotted for the reception of trains carrying men or material to one or more Army Corps. The situation and allotment of these must, of course, vary according to the operations of the campaign; timely notice of all such changes is given to the Army Corps Commanders, and to the Superior Commission at the War Ministry, so that the proper orders may be issued to all other functionaries concerned. These stations are specially prepared to fulfil the uses to which they are destined—the platforms, sidings, sheds, and other means of shelter, &c., are allotted to special uses, and supplemented

when necessary—but no magazines or dépôts must be established within the station itself.

The daily time-tables for all trains running between the transition station and the terminal field stations are fixed by the Field-railway Commission within whose section the line runs. These tables provide, not only for the train service to and fro between those stations, but also for a certain number of through trains, travelling without break, either from the magazine stations along the home lines, or from the departure stations within the Army Corps regions. Special trains, not included in the time-tables, are dispatched only on the order of the Field-railway Commission, which is given only under the following circumstances, viz. :—To provide for the safety of the railway itself; or on an express order from the Field-railway Direction; or on a written requisition from a General Commanding an Army Corps, declaring on his own responsibility that such a step is absolutely necessary. Each train in the time-tables is numbered, those proceeding in one direction are given the odd numbers, and those in the opposite direction the even numbers. No train is allowed to start before its appointed hour, nor until the expiration of ten minutes from the departure of the train or engine preceding it in the same direction.

On a double line of rails, only one (the left) line is used in the same direction, and this rule must only be departed from in cases of accident, or when the line is under repair at certain places, and then only when the greatest precautions against collision are previously taken. The railway transport regulations contain most minute instructions of a technical character, relating to the movements of trains, signals, precautions against accidents, &c., applicable to the single as well as to the double line; these are doubtless drawn from the traffic rules in force for the ordinary service of the lines. They also contain every detail connected with the forms to be observed in obtaining transport for men and material, prescribing minute rules respecting tickets, the reception and delivery of goods, payments where civil traffic is allowed, and a host of technical details, only suitable to the particular modes by which traffic on the French railways is conducted, and therefore not very instructive to a stranger. It is more profitable to notice such portions of the regulations as are not only highly interesting in a military point of view, but which may also be considered to be more or less applicable to military railway transport generally.

It has been recently decided, by the Minister of Public Works, that a military train may consist of as many as fifty carriages (or, in railway parlance, *coaches*, a useful term which embraces every kind of vehicle in the composition of a train, the engine alone excepted). It must never exceed this number where the number of passenger-carriages in its composition is more than four; where there are no more than four such carriages, the train is considered to be a goods train, and treated accordingly. The maximum formerly authorised was forty, but this was found in some instances insufficient to convey entire tactical units at their war strength.

The principle upon which the trains carrying the combatant units

are made up affords special facilities for dividing the train into two halves, should such a step be necessary, either to overcome difficulties in traction or for any other purpose; each half being fairly complete in a military point of view; this will readily be seen on reference to the composition of trains for each arm, presently to be noticed.

The average speed of military trains conforms, more or less, to that adopted in the ordinary goods traffic, and is thus estimated under ordinary circumstances:—30 kilometres (18·6 English miles) per hour for trains having a maximum of forty coaches; 25 kilometres (15·5 English miles) when they have from forty to fifty coaches. This does not include any periods during which the train is halted, nor does it allow for the diminution of speed on approaching and leaving halting-stations or for other occasions, all of which must be separately calculated. The regulated halts for the convenience of the troops are—a halt of fifteen minutes at the expiration of an hour or an hour and a half after departure; fifteen minutes at the end of every three hours or thereabouts; two halts for meals every twenty-four hours of the journey, each lasting from one to two hours. Where time has been lost and has to be regained, these latter may be reduced to forty-five minutes as a minimum, and the former to ten instead of fifteen minutes.

The relations existing between the commander of the troops *en route* and the working staff of the line are governed by the principle of mutual non-interference in technical duties. The entraining and detraining of the troops, &c., are conducted entirely under the orders of the military commander; but, from the moment the carriage doors are shut, the conduct of the train is exclusively in the hands of the railway guard. The only exception to this rule is, that when the Commander of the troops has reason to believe that the train may be attacked, he himself may assume the direction of the train on his own responsibility, and all concerned must obey his orders.

In strategical movements by rail, the troops receive the whole of their bread rations before starting; but if the duration of the journey exceeds forty-eight hours, a fresh issue is made at some route-station: they also carry with them one cold meal cooked under their own arrangements, receiving in addition every twenty-four hours, at the pre-arranged halting stations, coffee in the morning and a hot meal at evening, each day; the cold meal they carry with them is renewed for the following day, when necessary, through the agency of the troops at one of the route-stations, under established regulations. On journeys lasting twenty-four hours the hot meal is, when possible, provided in some barrack near to the halting station, an officer from which attends to conduct the troops to and fro; for lesser journeys, each company usually makes its own arrangements for meals.

The horses of all services are watered and fed on the journey according to the regulations applicable to cavalry, which will be presently noticed.

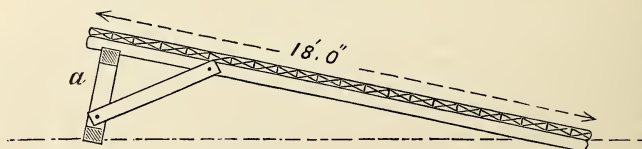
For large operations, the troops themselves can be employed in the preparation of the stations, when the existing accommodation for entraining and detraining is insufficient. It is not considered neces-



sary that infantry soldiers should have a regular platform, although in some cases it may be advisable to heap up the earth or ballast to form a sort of banquette to facilitate access to the carriages when large numbers are concerned; but for cavalry and wheeled vehicles platforms are constructed of sufficient length, where possible, to enable a whole train to be filled or emptied at once, estimated at from 273 to 327 yards. These are constructed, when circumstances permit, alongside of a siding; the breadth given to them at the top is at least 13 feet, when they are accessible throughout their length by a continuous ramp, and 26 feet when ramps can only be placed at certain points. The inclination of the ramps varies from  $\frac{1}{10}$  to  $\frac{1}{6}$  as a maximum; the face of a temporary platform is usually reveted with timber or sods; the platforms are continued round the ends of the sidings when possible, so as to form what is termed with us a dock, to be utilized for loading endwise.

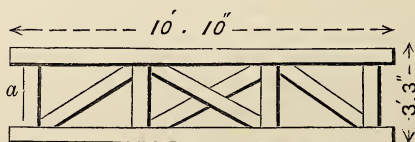
Portable ramps (*rampes mobiles*) are also largely used, and as they can be conveyed in pieces from the stores in which they are preserved to any part of a line of railway, and very readily put together, the erection of ramp of any required length occupies little more time than that necessary for their transmission. The wooden portable ramps intended for horses, wheeled vehicles, and other material, consist of four sleepers or balks overlaid with boards placed transversely, the front end towards the rails is raised to the proper level for entraining by means of a framework of wood placed parallel to the rails, each sleeper being secured to the frame upon which it rests by two chain cramps tightened by wedges, and by a wooden tie-piece to preserve the rigidity of the structure. The figure No. 1, here given, roughly illustrates without details a longi-

FIG. 1.



tudinal section of a *rampe mobile* in position, and an elevation of the front frame (a) is shown in fig. 2.

FIG. 2.



The ramp being 18 feet long, and the height at which its front stands above the ground being approximately 3 feet 8 inches, its incline

must be about  $\frac{1}{8}$ ; the length it occupies along the line is of course equal to that of its front frame, viz., 10 feet 10 inches, which stands  $35\frac{3}{8}$  inches from the centre of the nearest rail. The weight of the whole of the parts together is about  $29\frac{1}{2}$  cwt.

For conveyance with the cavalry and artillery trains, so as to enable them to be unloaded at any part of the line where no platform exists, there is a smaller pattern of portable ramp partly constructed of iron, the length of which is 16 feet 5 inches, and the breadth of front 7 feet 10 inches; it is furnished with iron claws for hooking on to the edge of the trucks instead of resting on a front frame, and can be applied either to the sides or ends of the trucks as may be requisite. A pulley is supplied with each of these smaller ramps for use in difficult cases, as the incline is greater than in the other kind of ramp. Other appliances for entraining and detraining consist of wooden stages (*ponts volants*) of two kinds: the first, intended to aid in the entraining of horses and vehicles from platforms by forming a connection between the platform and the truck, is 4 feet 11 inches in length, and the same in breadth; it has iron fittings to connect it with the side of the truck, and battens across its flooring to prevent the horses slipping. Two such stages of rather less breadth are provided for each portable ramp of the heavier class to connect the top of the ramp with the truck. The other description of stage is for the purpose of connecting endwise the floors of the trucks, so as to make a continuous passage from truck to truck when end loading is resorted to; its breadth is 3 feet  $3\frac{1}{2}$  inches (1 metre), but its length varies from that to 5 feet 6 inches, according to the length of the buffers used by the different companies.

The transport of infantry by railway is conducted in the following manner.

On the receipt of the order a regimental Officer, specially told off to superintend details connected with the movement, is sent to the departure station to make himself thoroughly acquainted with, and to report upon all its arrangements. On the day fixed for the movement this Officer, accompanied by a *sous-officier* selected as his assistant; the baggage detachment, consisting of the regimental transport and Officers' horses, under charge of the baggage-master; a detachment of men to render assistance, together with a guard bringing with them men in confinement, precede the troops to the station by half an hour. The Officer proceeds to examine the train and note the allotment for each truck, his assistant following him and as fast as possible marking each truck with chalk, giving those intended for men, horses, and *matériel* each a separate series of numbers, and at the same time marking the number of men or horses each will contain; these marks are made on the footboard between the doors of passenger carriages, and on the sides of the horse-trucks.

Soldiers equipped and armed are allotted to the carriages in the proportion of ten ordinary places for nine men if the journey does not exceed 93 miles, and ten places for eight men for greater distances, the vacant places being used for the knapsacks and other equipment.

The Officer then directs the baggage-master to the proper place for

entraining his charge, the work being performed by the troops in co-operation with the railway officials. The horses are entrained under the rules applicable to cavalry, which will presently be noticed, and the regimental transport carriages, which are mostly two-wheeled carts, are conveyed at the rate of two per truck; the wheels being scotched and the bodies lashed.

The troops themselves must arrive at the station three-quarters of an hour before the departure of the train. The Officer sent before hands to the commander a statement showing the allotment of the railway carriages according to their numbers; the battalion is drawn up in the most convenient spot, previously selected for the purpose; the *sous-officiers* and others are placed in the ranks, and the Adjutant-Major proceeds to tell them off into squads corresponding to the contents of the carriages without distinction of companies, each squad being indicated as No. 1, 2, 3, &c., according to its position in the line. During this operation the *sous-officiers* and corporals are distributed among the squads, in each of which a *sous-officier* is named chief of the carriage. The pioneers, the band, drummers, and buglers maintain their relative positions and occupy the foremost carriages. In proceeding to the platform each squad marches at two paces distance from that in front of it, and is halted by its own chief, fronting the carriage bearing its number. By forming fours deep the squad is made to occupy the same length of platform as the carriage. At the proper bugle-sound the men take off their packs and bring their pouches to the front, the bandsmen and drummers depositing their large instruments and cases in the baggage van at the head of the train. Two men then enter each compartment, the rest passing their packs to them in succession for arrangement under the seats and in the vacant places. When seated the men hold their rifles between their knees. They are forbidden to shut the carriage-doors, this being done by the railway officials only.

When all the troops are in the carriages, the entraining Officer's assistant marks with chalk by the side of the number of each carriage the designation of the company which occupies it, and the chalk marks are all repeated on the opposite side of the carriage, the men being required to remember them. The guard, commanded by an Officer, and consisting of a sergeant, corporal, bugler, and fifteen men, which accompanies the baggage detachment to the station and is in charge of prisoners, is placed in the carriage next in front or rear of the Officers' carriages. The Commanding Officer, accompanied by the Officer of the guard, the station-master, and the guard of the train, makes a rapid inspection of the whole train before taking his place.

During the journey the men are forbidden to put their heads or arms out of the windows, or to open the doors, raise cries, or smoke either in the horse-trucks or in carriages where straw has been provided for the sake of warmth in cold weather.

The Officers are informed beforehand of the stations at which the trains will halt for ten or fifteen minutes, to enable the men to get out of the carriages. At these stations the company Officers proceed to their men's carriages, the regimental guard places such sentries as are



necessary to prevent men straying or entering forbidden places. When the bugle sounds the *Halt* the men are at liberty to quit the carriages at the proper side only, leaving their arms behind them. Three minutes before the train again starts the bugle sounds the *Advance*, when the men must return to their places.

Advantage is taken of these halts for the Officers to visit the horses and *matériel*, to see that all is in order; and on every other occasion of the train stopping for five or ten minutes it is the duty of the Officer of the guard, who travels in one of the Officers' carriages, to make a rapid survey of the train, when, if he thinks proper, he can allow any particular men to descend on urgent necessity.

At the station preceding that at which the troops are to detrain they are properly warned to get themselves ready; on arrival the Commanding Officer at once inspects the station and makes all arrangements for parading them, placing such sentries as may be necessary, and telling off a portion of the guard to take charge of the baggage, while the same Officer who made arrangements for the entraining takes in hand all details connected with detraining of the horses and *matériel*. At the proper bugle-sound the men leave the carriages, the two last men in each compartment handing out their knapsacks, which the men put on and form in squads opposite their respective carriages in the same way as on entraining. In this order they leave the station, and are formed by companies outside. Meanwhile the train is searched by the *sous-officiers*, aided by the railway officials to ascertain if anything has been left behind. The baggage-guard, with a detachment told off to assist, proceed to the platform at which the baggage and transport is to be detrained, under the superintendence of the baggage-master; the Officers' horses are first taken out and afterwards the rest of the horses and *matériel*. When no regimental transport accompanies the troops, the baggage-master makes arrangements for the conveyance of the baggage under certain definite regulations.

The carriages used for the conveyance of troops are:—first class, reserved for Field Officers; second class, for other Officers; third class, for non-commissioned officers and men; this regulation is, of course, modified when circumstances render it necessary. In large operations, owing to the comparative paucity of passenger carriages in France, as in other Continental countries, troops are, to a considerable extent, conveyed in covered goods wagons, fitted with seats for the purpose in the manner most suitable to the wagons in use by the different companies; thus, a covered goods wagon of the Eastern Company, 17 feet 10 inches by 8 feet interior measurement, is fitted for 30 men, sitting in the same manner as in the ordinary English passenger carriage. The space opposite the central door is left clear, and in it the knapsacks and rifles are stowed, thus rendering it unnecessary to leave any of the seats vacant for this purpose. Openings to serve as windows are made in the upper part of the sides of the wagons. On long journeys the Commanding Officer is at liberty to interchange men between these and the ordinary passenger carriages—altering, of course, the marks on each to suit the change of companies, &c.

An infantry train is made up as follows, and is intended to carry a battalion complete, viz. :—

The engine and tender.

The guard's van, containing also Officers' baggage, &c.

Part of the soldiers' carriages.

The Officers' carriages.

The other part of the soldiers' carriages.

A baggage truck supplementary to the guard's van.

The regimental transport carriages and horses.

A break van.

The general rules applicable to the transport of infantry are, with some modifications, applicable also to the men of the mounted services, and the preliminary steps with reference to the appointment and duties of the regimental Officer supervising the arrangements, are also very similar.

There are two recognised methods of arranging troop-horses in the cattle trucks, according to the dimensions of the truck. The one is to place them in two rows facing each other, the tails of the horses being against the ends of the trucks, and their heads towards the centre, where there is left an interval opposite the doorway; each horse's head-rope is secured to a ring in the roof, placed sufficiently far back over his shoulder to prevent a forward movement, and a cord is stretched from side to side of the wagon in front of their breasts. In this manner eight horses can be placed in a truck, four in each row; excepting only *cuirassier* and *gendarmarie* horses, three of which form the row, that is six per truck.

The minimum interior length of the truck to suit this method must be 17 feet 8½ inches; in trucks of less length the horses stand transversely, that is at right angles to the rails, all facing the same way and the head-rope of each being tied short to a ring in the side of the wagon. In calculating accommodation by this method, the following is the breadth allowed for each horse, viz. :—

	English inches.
Light cavalry, unsaddled .....	21·65 to 23·62
Do., saddled .....	23·62 to 25·59
Cavalry of the line or reserve, or a draught horse with harness, unsaddled	23·62 to 25·59
Do., do. saddled	29·52 to 31·49

thus, from seven to nine horses can be placed in each truck.

In the absence of special orders to the contrary, horses are always unsaddled; this is considered necessary, particularly on long journeys, both for the sake of the horse and for the preservation of the saddlery; as a rule draught horses keep on their harness. Two men as a stable guard travel in each.

When the method of entraining first described is employed, the saddles are piled in the space opposite the door, the rations of corn being kept there also; but when the transverse method is used, special wagons are allotted to the saddles and corn, at the rate of about sixty saddles to a wagon; the rations of hay are carried in separate

covered wagons; in packing the saddles, the crupper, breast-plate, girths, and horsecloth are gathered up on the seat of the saddle and secured there by means of the surcingle, the stirrups are also taken up and secured; to prevent injury to the saddles and to keep them in position when piled one on the other, the lowest saddle is placed across a cylindrical pad of straw, tightly bound together, 4 feet 3 inches long and  $15\frac{1}{2}$  inches in diameter, requiring each about  $26\frac{1}{2}$  lbs. of straw; these are made up by the men in barracks before starting. Straw to litter down the floors of the wagons is also drawn by the troops at the rate of  $5\frac{1}{2}$  lbs. per horse.

The last feed is given to the horses at least two hours before entraining, after which they are watered; their daily ration during the journey consists of 11 lbs. of hay and nearly  $4\frac{1}{2}$  lbs. of corn; entire rations for the journey, provided it does not exceed two days, are drawn before starting.

Each soldier is provided with a cloth label with his name, number, &c., upon it, to affix to his saddle, in such a manner that the name may be easily read.

As in the case of infantry, the Officer having charge of the entraining, the baggage detachment, the guard, forage, &c., precede the troops to the station, and the marking of the carriages is performed.

For *gendarmérie* and cavalry of the line or reserve, ten places are allotted to eight men; for light cavalry, ten places to nine men if the journey is under 93 miles, otherwise ten places to eight men.

The troops themselves arrive one hour and a-half before the time of departure—they are drawn up in single rank opposite the entraining platform, the rear rank man on the left of his front rank man, the *sous-officiers* and trumpeters entering the ranks—the Commander then tells them off in squads according to the content of the trucks, allotting a *sous-officier* or brigadier to each, they then dismount and place their carbines and swords in piles at sufficient distance to be out of the way, the helmets and cuirasses being deposited by the side of the arms. The horses are then unsaddled, the men of each file alternately holding both horses during the proceeding; if the horses are to stand parallel to the rails, the saddles are in the first instance placed behind the ranks, to be arranged in the same trucks after the horses are entrained; if the other method is adopted, the men of each file carry their saddles in succession to the saddle trucks, in each of which, ready to receive them, are a *sous-officier* and four men, previously instructed in the proper method of stowing them away, who have by this time arranged the straw pads for the lowest saddle of each pile; the horses keep their bridles on.

It is the duty of the railway employés to properly place the stages at the doors of the trucks before they are opened, and to remove them after they are closed; while the horses are entering a trooper stands on each side of the stage, to prevent them getting crosswise upon it and their feet from slipping between the truck and the platform.

To entrain the horses so that they shall stand in the trucks parallel to the rails; on the order being given, the first man of each squad



leads in his horse, the bridle being still on, turns to the right and places him close to that side of the wagon by which he entered, head towards the centre, each succeeding horse of the same row being formed upon him: when one row is complete a cord is stretched in front of the horses' breasts, secured to the sides of the truck by rings; the men fasten the head-ropes to the rings in the roof and go for their saddles. The opposite row is formed in a similar manner, and the saddles are then piled in the central interval; the two men of the stable guard leave their arms and head-dresses with their comrades, and as soon as the journey has commenced and the horses are quiet, they take off their bridles and stow them carefully on the piles of saddles.

When the horses are to stand perpendicular to the rails the horses are led off in succession, and on entering the truck are turned alternately to the right and to the left, so that the two ends of the truck are first occupied and the centre places reserved till last; each man fastens his horse's head-rope as short as possible to the ring in the side furthest from the platform, takes off the bridle, and returns with it to his place in the ranks; the two last horses are not passed in till the others are secured, and the men have left the truck; their riders form the stable guard, which is relieved every three hours. These men are accommodated with two portable seats (*strapontins*), slung by ropes against the side of the truck and between the horses' heads, after they have been properly secured. The doors are shut the moment the two last horses are in.

The Officers' horses either accompany those of their respective pelotons, or are placed together in separate trucks, as the Commander may determine.

When the horses and saddlery have been disposed of the men take up their arms, helmets, &c., and fall in opposite the passenger carriages, to which they are then told off in the manner already described for infantry; the bridles, carefully made up, are placed under the seats, the helmets, &c., in the vacant seats, the swords and carbines are held between the knees; cuirassiers stow their cuirasses in piles under the seats, leaving room for the bridles. When the entraining is complete the contents of each wagon are carefully marked upon it with chalk by the side of its number, and each trooper is expected to remember the number of his own wagon as well as that in which he has placed his horse. As in entraining infantry a final survey of the train by the Commanding Officer takes place, and the instructions relative to the behaviour of the men during the journey, and when a halt takes place, as well as the arrangements for their meals, are the same.

The men of the stable guard are instructed to speak to the horses, and make much of them when the engine whistles, and when the train starts or halts; in case of accident they are to endeavour to attract attention from the windows. At the relief of the stable guard, and on other occasions, when the horses stand transversely, considerable care is requisite at the moment of opening the doors to avoid the accident that must happen if either of the horses opposite the door should

step back; at these times, therefore, the men stand at their heads, soothe them, give them a handful of corn, and divert their attention; the door is opened just sufficiently wide for the relief to step in and take their places at the horses' heads. The others quit the wagon quickly, and the door is at once closed.

During the journey the stablemen feed the horses by hand with small quantities of hay supplied to them periodically from the hay wagons as opportunities offer; at the feeding stations the corn is distributed in the corn bags, and the water-buckets are passed to the stable guard through the windows. These buckets are made of sail-cloth, and are supplied to the watering stations by the military authorities; the railway companies have, however, undertaken to construct in future all their new fire-buckets of the same pattern so as to serve for this purpose.

It will readily be understood that the method by which the horses stand in the trucks parallel to the rails is far more convenient than the other as regards the feeding, watering, and the general attendance of the stable guard upon the horses; the two men are better accommodated; it affords also the very great advantage of not separating the saddlery from the horses, and thus saves time in collection and redistribution, and the danger connected with the opening of the doors is to a considerable extent obviated.

The operation of detraining cavalry is precisely a counterpart of that of entraining, the order of proceeding being reversed.

The men descend with their arms and bridles, but helmets, cuirasses, &c., are left in the carriages until required; the arms are piled, and the men fall in. When the Officers have ascertained that each man remembers the number of the truck where his horse is, the Commander gives the word to detrain them, and each man proceeds to his proper truck; the saddles in the horse-trucks are first taken out and carried to the place of formation; each man then bridles his horse, leads him out in the order the reverse of that observed when entraining, and the squads form in single rank on the ground indicated.

In the transverse method of stowing the horses, the bridles of the two centre horses are passed in through the windows to the stable-guard, who put them on, and, on the door being opened, back out the horses and form up; the rest of the men enter, put on their bridles, and lead out alternately from right and left. The men who packed the saddles on entraining attend to their unloading, and when the squads are all formed the front rank men first go for their saddles, the rear rank men holding the two horses, when the front rank have saddled the rear rank go for their saddles; the arms, helmets, cuirasses, &c., are resumed in a similar manner.

A cavalry train is made up as follows, and is intended to carry squadron complete, viz.:—

Engine and tender.

Guard's van, containing also Officers' baggage.

A truck with saddles.

A platform truck with the portable ramps, if such are carried.

Part of the horse trucks.

One truck with saddles.

Part of the soldiers' carriages.

The Officers' carriage.

The other part of the soldiers' carriages.

The other part of the horse trucks.

The forage truck.

A truck with saddles.

A truck for regimental transport.

A break van.

Artillery are entrained on principles precisely similar to those already described with reference to the other two arms; they require, however, in addition to the stages already referred to, a certain amount of accessory material, lashings for the guns and wagons, pieces of board, large triangular wedges to help the wheels over the cross battens and raised borders of the platform-trucks, and hand-spikes. All regulations applicable to cavalry are observed with reference to artillery horses, and the draft horses retain their harness as in the other services.

For the transport of artillery carriages, platform-trucks of different patterns and dimensions have to be employed, the interior measurements varying from 14 to 21 feet in length, and from 6 feet 7 inches to 9 feet 6 inches in breadth, some having smooth floors and others having projecting battens across the floors; some without any raised borders, and others having borders either at the sides only or all round, which cannot be let down.

Two complete field artillery carriages, including limbers, for guns of 7 centimetres or 12 centimetres, can be loaded on a truck which has a smooth floor, at least 19 feet long, if the end borders are fixed, and at least 17 feet 8 inches long, if these let down.

One carriage complete, with an additional body or limber, for the same guns, can be loaded on a truck having a length of floor between 14 feet 9 inches and 19 feet, whether it be smooth or constructed with raised battens; and, if the ends let down, a length of 17 feet 8 inches will suffice for either description of floor.

For batteries armed with guns of 4 centimetres or 5 centimetres, two complete carriages can be loaded on any truck having a minimum length of 17 feet 8 inches; and from that down to 14 feet 9 inches, a complete carriage, with an additional body or limber, can be carried.

No truck, of a length less than 14 feet 9 inches, can contain more than one complete carriage, nor can any of the trucks before specified, upon which a forge, forage, or store wagon is loaded, carry, in addition, more than one body or one limber.

The battery or detachment must arrive at the station two hours before the train starts; all the necessary information is at once given to the Commander by the Officer who has preceded the troops, and, according to his report as to the dimensions of the trucks, the guns, carriages, &c., are told off into proper sections for entraining, the Officers being distributed to superintend. This must be so arranged that the three hindmost trucks shall not convey any carriage containing ammunition. The leaders and centre horses are unhooked, the gun or carriage is



drawn to the place opposite the proper truck by its wheelers only, which are then taken out, and all the horses are formed up together.

The entraining of the carriages, &c., is effected either at the side or end, according to the construction of the platform. For end-loading, the carriages are in most instances brought up one by one to the dock, and when loaded passed to the line on which the train is being made up, by means of a turn-table or otherwise.

To load in this manner two wagons, or a gun and wagon complete, on one truck, two portable stages (already described) are placed to connect the dock with the truck; the first body is passed on to the furthest end of the truck, trail towards the rear, wheels jammed against the end; the limber is then run on, its wheels being made to interlock as much as possible with those of the body, its pole<sup>1</sup> towards the rear, with the end resting on the floor; the second limber follows, pole foremost and elevated so as to rest upon the limber-boxes of the first; finally, the second body, trail foremost, passing under the limber and resting on the floor, wheels interlocking.

When only one complete carriage and an additional body or limber are to be stowed together, as soon as the first body is placed, as before, the limber is passed on, pole foremost, and elevated over the body, wheels touching, then the additional body or limber, with the trail or pole, as the case may be, also foremost, but passing under the limber already on. In either of the foregoing cases a wagon body which carries a spare wheel on a pintail behind, is the one to be passed on last, so that the wheels may not interfere with the elevated pole of the limber.

The method of loading by the side is as follows:—Two trucks, the first and second, are connected at their ends either by letting down the ends or by means of portable stages of the proper pattern, the side of the first truck is also connected with the platform by two portable stages; a body and limber are passed on to the first direct from the platform, and stowed, as already described, at that end which is furthest from the second truck; the side stages are then moved to the second truck, and the loading of the first is completed by running the pieces from the platform to the second truck, and thence to the first over the ends.

In this manner truck after truck is rapidly loaded, until the last is reached, when an alteration of the method becomes requisite. The proceeding, when two complete carriages are stowed together, is as follows:—The first body is passed on trail to the rear, and stowed with its wheels against the end furthest from the truck last loaded; the second body follows also trail to the rear, and is placed with its wheels resting on the stages which connect the truck with the one last loaded, care being taken to scotch the wheels; a limber is then run on pole to the rear, and is stowed so that its wheels interlock as much as possible with those of the first body; its pole is removed and placed on the floor along the furthest side of the truck, so as not to interfere

<sup>1</sup> The French artillery carriages are fitted with poles, not with shafts as in the English service.

with the stowing of the limber which is to follow; this is now brought on pole to the rear, and turned into its place, so that its wheels interlock as much as possible with those of the first limber, and its pole rests upon the boxes of the same; finally, the second body which has its wheels upon the stages is brought forward on to the floor of the truck, and the whole of the pieces stand in the same relative positions as on other trucks, the only difference being that one pole remains detached.

When less than two complete carriages are stowed together the proceeding is precisely analogous to the foregoing; and when there is a sufficient supply of portable stages and other accessory materials, the train can be told off into groups of two or more trucks, so that separate operations may be carried on simultaneously at each group.

When one complete carriage only (that is one body and one limber) is placed upon a truck the wheels are outwards, the trail and the pole towards each other, the trail on the floor, the pole elevated over the body.

In entraining artillery carriages the following precautions are necessary:—Care must be taken to distribute the weight over the floor of the truck, so as not to strain the springs; neither the poles nor the spare wheels must project beyond the buffers; the poles must not be raised before the proper time, so that the ammunition boxes shall not be swung about unnecessarily, and these latter must never be allowed to be in contact one with another; the several parts of the truck-load must be most carefully lashed and secured together, so as to give stability to the whole, and the scotches which are applied to the wheels must be nailed to the floor.

The entraining of the horses commences as soon as they are all freed from the carriages and formed up for the purpose; it is conducted in the same manner as for cavalry, as also is the stowing of the saddles, the entraining of the men, and other details connected with the operation. The *near* horses, namely those ridden by the drivers, are unsaddled like the rest of the riding horses; the draught horses retain their harness, and, in order to prevent the traces causing inconvenience, those of the wheelers are crossed under the horse's belly close to the girths, then brought round his body and secured together on his back near the withers; the long traces of the leaders and centre horses are first crossed over the back near the withers, then passed under the belly and secured together on the back.

The operation of detraining artillery is effected in a manner precisely analogous to the entraining, the order of proceeding being of course inverted.

An artillery train is made up as follows, and is intended for the transport of a battery complete, viz.:—

The engine and tender.

The guard's van, containing also Officers' baggage.

A truck with saddles.

A platform truck with portable ramps, if such are carried.

The horse trucks.

The forage truck.

A truck with saddles.

The Officers' carriage.

The soldiers' carriages.

The trucks with battery material, the three last without any ammunition.

A break van.

The pontoon equipment for an Army Corps is conveyed in three trains, each of thirty-four or thirty-five coaches; that for an army in six trains of similar composition. The trucks to convey pontoon carriages must have a floor-length of at least 17 yards 4 inches, and each carriage requires a separate truck.

The carriages of the Military Train (*train des équipages militaires*) are of many different kinds; some of their four-wheeled carriages do not lock under, and some are of unusually large dimensions, each of these must have a separate truck for its conveyance; others are of moderate dimensions, with their fore-carriages locking under, as in the pattern of 1874, which corresponds more or less closely with our general service wagon. Two of this latter description can be conveyed on a railway truck having a floor at least 19 feet 8 inches long and 9 feet 3½ inches broad; and one wagon of this kind, together with a two-wheeled cart, can be loaded on a truck with a floor 17 feet 11 inches long by 8 feet 2½ inches broad. Trucks of a length less than 17 feet 11 inches will carry only one wagon of any description, or two carts.

The process of loading two four-wheeled wagons on one truck is performed as follows, the loading being of necessity over the end of the truck, as the wagons cannot in this case be brought into their proper relative positions by side loading:—The first wagon, fore-carriage to the rear, is passed on and moved to one of the furthest corners, so that both the hind wheels touch the end, and one of those wheels is close to the side of the truck; the pole being removed, the fore-carriage is completely locked under, its axle-tree at right angles to the other axle-tree, and its splinter-bar turned outwards; this has the effect of getting the inner fore-wheel out of the way, and thus reducing the breadth occupied by the fore part of the wagon; the second wagon, fore-carriage foremost, is then run on, its wheels being kept close to the opposite side of the truck; its fore-carriage is completely locked under, splinter-bar outwards, similar to the other; it is then moved forward until the bodies of the two wagons overlap at the fore parts, the hind parts being at diagonally opposite corners of the truck; the fore-carriages are lashed together to keep them steady, and the hind wheels are secured to rings in the floor. If a crane is used for entraining the wagons, which is an exceptional proceeding, they are lowered at once into the positions above described.

To load one four-wheeled wagon and one two-wheeled cart on the same truck, the wagon is first passed on, and placed in the same position as in the operation just described, excepting that the fore-carriage is not locked under; the cart is then passed on shafts foremost, and the body in the corner diagonally opposite to the wagon



body, the shafts rest on the floor, one of them passing under the fore-carriage of the wagon, the other clear of it.

The instruction of the troops in the operations of entraining, when they are quartered in localities where it is impossible to make use of actual railway lines and rolling stock for this purpose, is carried out by producing a very fair imitation of the reality in the barrack-yard or drill ground, by the following methods, viz.:—For entraining and detraining military carriages, a rectangular framework of wood, 19 feet 8 inches in length, and 7 feet  $2\frac{1}{2}$  inches in breadth, is laid out upon the ground so as to represent the floor of a railway truck; the end pieces can be adjusted, so that any less length down to 17 feet 8 inches can be given to it according to the pattern of the actual trucks with which the troops are likely to be concerned. Another similar frame is placed in juxtaposition to the first, endwise, so as to represent a second truck in the same train, an interval of 3 feet  $3\frac{1}{2}$  inches between their ends being left as the space occupied by the buffers. A trench 3 feet  $3\frac{1}{2}$  inches broad at the top, and the same in depth, is then dug immediately outside the frames completely enclosing the space they jointly occupy; this represents the interval between the platform and the floor of the trucks, the level of the platform being that of the natural ground. In this manner it is possible to carry on exercises in entraining military wagons, &c., both by the side-loading and end-loading methods. This description of exercise is especially applicable to the soldiers of the Military Train, each squadron of which is supplied with all the necessary appliances of the same kind as are used on the actual railway. An additional advantage is gained whenever, from the nature of the ground, it is possible so to arrange that at one end of the space representing the trucks there shall be a drop to the ground-level of about 3 feet  $3\frac{1}{2}$  inches, which would serve to represent the case of entraining or detraining at any part of the line where no platform exists by means of the portable ramps carried in the train.

Similar exercises in entraining horses are conducted very much in the same manner, with the unquestionable advantage of accustoming the animals, as well as the men, to the operation. In this case the floor of the representative truck is made 18 feet  $4\frac{1}{2}$  inches in length and 8 feet  $2\frac{1}{2}$  inches in breadth; this space is enclosed by a railing 4 feet 3 inches in height, with an opening in the centre of each side 4 feet 11 inches broad, to represent the doorway. In each side of the railing are ten holes at a height of 3 feet  $3\frac{1}{2}$  inches above the floor through which to fasten the head ropes of the horses when they stand at right angles to the rails; and, when they stand longitudinally, two holes on each side serve for fastening the breast lines in front of the rows as before described. The trench outside the frames is in this case about 4 inches broader, and need only extend along the two sides. It is arranged, as in the former, that where circumstances permit, there shall be a drop of 3 feet  $3\frac{1}{2}$  inches from one of the sides to the ground level, to simulate the case of entraining or detraining the horses at any part of the line.

When the exercise has reference to the entraining of men only, the

rectangular spaces representing the railway carriages are traced upon the ground with the pickaxe or with cords, or in any other convenient manner, with the usual intervals between their ends; this suffices to indicate all that is necessary respecting the dispositions to be made, the subdivisions into which the troops must be told off, &c., any number of separate railway carriages may be thus typified as forming part of the same train, according to the number of men to be instructed and the extent of ground available.

The troops are also trained in all other details necessary for entraining operations, such as the preparation of the straw pads and stowing the saddles, the management of the harness, and arrangements to be made when horses have to travel with their saddles on, &c.

In countries situated as is France, with powerful neighbours keenly alive to the advantages derivable from the gain of a day, or even a few hours, in the concentration of their armies, it is scarcely possible to over-estimate the important results that might ensue from a careful attention to personal training of this description, in conjunction with a well-defined system for utilizing to the utmost the available railways. There can be no doubt that, in military movements, the carrying capacity of railways is restricted far more by the difficulties which attend the entraining, detraining, &c., of large bodies of troops than by considerations having reference only to the technical working of the lines, and every step taken to diminish those difficulties must, in a very great degree, clear the way for a corresponding reduction in the interval at which trains will follow each other upon the lines, and consequently in the time occupied in effecting the concentration of forces for offensive or defensive purposes.

The efficiency of the present regulations for large strategical movements remains, of course, to be tested; but that portion of the system which relates to the transport of troops during peace may certainly be said to have had a very good trial during the past year (1878), when very large numbers of reserve men were called out, in immense batches, for a few days' training, while at the same time others were being dismissed to their homes. The distances travelled by individuals were no doubt inconsiderable, but it must be remembered that the main features of the necessary arrangements depend but little upon distance. Judging from accounts given by the correspondents of our own press and the known arrangements of the Government with respect to the training of the reserves, it may be computed that, on more than one occasion, something like 100,000 men must have travelled by train on the same day in different parts of France, yet there appears to have been no derangement of the ordinary traffic, and it was even said that the travelling public were scarcely aware that any unusual movements were taking place. The country may, therefore, have good reason to hope that the still untried portion of the system may prove equally successful.

## REPEATING RIFLES.<sup>1</sup> A SHORT ACCOUNT OF THOSE IN USE IN FRANCE, NORWAY, AUSTRIA, AND SWITZERLAND.

By Lieutenant WALTER H. JAMES, R.E.

PUTTING aside for the present all consideration as to whether magazine rifles will form the armament of the future or not, we propose, in the following pages, to give a short description of those which have already been introduced, or are in the course of introduction, by different Powers. Up to the present time, Switzerland alone has introduced a repeating rifle, the Vetterli, as the general armament of her infantry. Austria has for some time past armed her gendarmerie with the Fruwirth, and is now making experiments with the Kropatschek rifle, which may possibly, should financial considerations permit, be the future armament of her forces. Turkey, as we all know, has armed her cavalry with the Winchester rifle, the best of the older forms of magazine rifles. France and Norway have introduced the Krag-Petersen and Kropatschek into their Navies.

The experiments which have lately been made in the first-named of these two countries (France) are particularly interesting from their exhaustive character. Indeed, for rapidity and thoroughness of investigation, the French Committee may serve as a model for others. The trials commenced on the 6th November, 1877, the report was sent in on the 29th March, 1878, and on 28th June, the order was given for the definite introduction of a repeating rifle as the armament of the Navy.

The history of the reasons which led to its adoption are briefly as follows. Not long after the introduction of the breech-loading rifle, pattern 1866, into the French Navy, its many defects became evident. It was found that after a few discharges it was impossible to load with facility, the gas-check did not act efficiently, the needles frequently broke, and the cartridges rapidly deteriorated.

In 1869 a report was sent in to the Government from the Mediterranean fleet, to the following effect:—

“The rifle, pattern 1866, forms a great improvement in the armament of the Navy. Its defects arise from its cartridge, and it would be well to call the attention of competent persons to this important question.”

Similar complaints were made by the Army after the war in 1870–71, and in 1872 a Committee was formed for the purpose of enquiring

<sup>1</sup> For the information contained in this article we are indebted so far as the French experiments are concerned to a brochure recently published by Messrs. Tanera, of Paris, entitled “*Expériences exécutées par la Marine sur des Fusils à Répétition*,” and which is itself an extract from the “*Mémorial de l’Artillerie de la Marine*.”



into and remedying its defects. The result of the labours of this Committee was the adaptation of the Chassepôt, according to the system proposed by Major Gras, which permitted the use of a metallic cartridge.

The Navy, however, reserved its decision as to the form of rifle to be introduced. There was no hesitation as to the cartridge. The desirability of having the same as that in use in the Army was too manifest to admit of doubt. Nor were the advantages of the metallic cartridge over that of paper for one moment denied. But it was an open question whether, while still employing the same cartridge, a repeating rifle could not be found which might be used alongside the weapon of the Army, and yet possess the advantages which a rifle of this class was considered to offer for the Navy. So far back as 1866, indeed, experiments had been made in this direction; but the magazine rifles then known had the disadvantages of being very complicated and of firing a light bullet with a small powder-charge. Further, they all necessitated the use of a metallic cartridge. This last fact would not have prevented their introduction; but in face of their complication and poor ballistic qualities, it was felt that the advantage of rapid fire was not sufficient to warrant their adoption, and thus involve the use of two different rifles, the one in the Army, the other in the Navy. But when a metallic cartridge was definitely introduced for land service, it became evident, that if this could be used in a repeating rifle, there could be no valid objection to the latter being brought into use in the Navy, provided it was thought otherwise advantageous to do so.

The opinion being general that, for sea service at any rate, the many advantages of magazine weapons rendered them desirable, it only remained to see whether a suitable pattern would be found. For this purpose a Committee was formed, as we have seen, in the autumn of 1877 to make the necessary experiments. The principal points to which attention was to be directed were:—

1. To ascertain that the rifles submitted were in no way inferior in their ballistic qualities (flatness of trajectory and accuracy) to the Gras rifle, the weapon of the Army.

2. To determine what the practical rate of fire would be with each rifle in the hands of ordinary seamen and marines.

3. To make sure that the cartridges in the magazine were not liable to explosion, either by the shock of discharge, or during drill, or in case of the rifle being allowed to fall accidentally, and to note what influence, if any, the alteration in shape of the bullets in the magazine had on the shooting.

4. To test the construction of each rifle and see that they fulfilled the necessary requirements of solidity and safety, both with ball and blank cartridge, and that they were not liable to be rendered useless by rust or dust.

The Committee had further to state whether, in their opinion, the introduction of a magazine weapon was desirable for sea service, and if so, which of the arms offered for trial was best suited for the purpose.

Three different patterns of rifle were submitted, the Hotchkiss, the Krag, and the Petersen, and three specimens of each kind were tested. The Hotchkiss rifle is an American invention, manufactured by the Winchester Repeating Arms Company. In outward appearance it presents somewhat the appearance of the Chassepôt, being a bolt breech-loader. The magazine is placed in the butt and holds five cartridges. It can be used either as a magazine weapon or as an ordinary breech-loader, the supply from the magazine being cut off. When used as a repeater the bolt on withdrawal ejects the old cartridge case, at the same time a new cartridge is forced up from the magazine by a spiral spring. On pushing the bolt forward to close the breech, the cartridge is pressed by it into the breech and the rifle is then ready to fire. By a simple arrangement the action can be locked, so that it is impossible to fire the cartridge. To load the magazine the breech-bolt is drawn back and the cartridges pushed one after another through the bottom of the breech-shoe into the tube in the butt. They are prevented from issuing, except as desired, by a projection on the upper surface of the tube, which catches the base of the front cartridge in the magazine.

The Krag rifle is a block breech-loader. The block is worked by a hammer placed behind the block in a prolongation of its axis. The magazine is placed below the barrel, as in the well-known Winchester rifle, and it holds eight cartridges. The rifle can be used as a repeater, or, by shutting off the magazine, as an ordinary breech-loader. When used as a repeater, the breech is opened by pulling back the cock which depresses the block, ejects the old case and allows a fresh cartridge to come from the magazine on to the block. The latter is much more hollowed out than is the case in the Martini-Henry; towards the back part the sides are brought round so as to form two shoulders, beneath which the fresh cartridge glides when the breech is depressed, and which prevents it falling out or being ejected by the force of the magazine spring beyond the breech. The cock is then allowed to go forward till it reaches the position of full-cock, beyond which it was originally pulled. This allows the breech-block to rise a little till it is caught by the extractor, which is provided on either side with a slight projection for the purpose. The cartridge in the block must then be pushed forward with the thumb, in doing so the extractor is pushed back into its place and the block closes, thus shutting the breech. The rifle can be lowered to half-cock and the magazine may be cut off, by simply pulling a bolt worked by a projecting knob on the right side of the breech casing, up across the mouth of the magazine.

To charge the magazine the breech must be opened and the hammer held back by the thumb while the cartridges are pushed in one after the other.

The Kropatschek, which is the invention of an Austrian Officer of that name, is, so far as regards its breech mechanism, almost identical with the Gras rifle, and like it can be placed at half-cock. Its magazine is placed beneath the barrel and holds six cartridges. It can be used either as an ordinary breech-loader or as a magazine weapon.

When employed in the latter manner, the breech-bolt is withdrawn as usual, this ejects the old cartridge case and brings a fresh cartridge opposite the barrel, which is then pushed into place by the forward motion of the breech bolt in closing the breech. The cartridges pass from the magazine into the elevator, which is not unlike the breech-block of the Krag rifle, and is situated immediately beneath the breech-shoe. This works on a pivot which passes laterally through its rear end. When the breech is closed, supposing the arm to be used as a repeater, a cartridge is pushed forward by the magazine spring into the elevator. When the breech-bolt is pulled back it causes the elevator to revolve round its pivot and thus brings the cartridge into the right position to enter the breech as previously described. To load the magazine, open the breech and push cartridge after cartridge into the former till full, then place one in the elevator, making seven in all, and close the breech.

The following table gives the principal dimensions and weights of the rifles tried, which had all the same calibre and fired the same, viz., the French regulation cartridge, with a bullet weighing 386 grains, the powder charge being 81 grains:—

Dimensions and Weights.	Hotchkiss Rifle, Nos. 1, 2, 3.	Kropatschek Rifle.			Krag Rifle, Nos. 4, 5, 6.	Regulation French Army Rifle.
		No. 1.	No. 2.	No. 3.		
Length over all.....	ins. 52·36	ins. 48·15	ins. 51·18	ins. 51·18	ins. 49·8	ins. 51
Length of barrel .....	32·23	29·25	32·28	32·28	32·28	32·28
Weight of rifle without bayonet .....	lbs. ozs. 10 5	lbs. ozs. 10 2	lbs. ozs. 10 9	lbs. ozs. 10 3	lbs. ozs. 9 6	lbs ozs. 9 4
and "magazine charged " loaded .....	10 14	10 14	11 5	10 15	10 3½	9 5½
No. of cartridges that can be carried in the rifle .....	6—5 in the magazine, 1 in the barrel.	8—6 in the magazine 1 in the elevator 1 in the barrel			9—8 in the magazine, 1 in the barrel.	1 in the barrel.
Distance of centre of gravity from heel-plate.....	ins. 20·5	ins. 20	ins. 21·14	ins. 21·34	ins. 21·42	ins. 21·5
	Magazine full ....	21	19·7	21·34	21 1	—
	Magazine empty..					

The first experiments made were to ascertain that the rifles submitted for trial possessed the same accuracy as the regulation arm of the Army. Thirty rounds were fired from each of the rifles of the different makers, and from three Gras rifles, at ranges of 200, 400, 600, 800, and 1,000 metres. The result showed that they might be considered equal in accuracy among themselves, and with reference to the land-service rifle. The men who fired the rifles were chosen from the sailors and marines at Cherbourg, and were good shots. When used as ordinary breech-loaders, it was found that the Hotchkiss and Kropatschek rifles were quite as rapid in their fire as the Gras, but that the Krag was slightly inferior to the latter. Under the same conditions, it was not found that having the magazine charged made any practical difference in either of the rifles. If anything, the Krag and Kropatschek were fired rather more quickly, the Hotchkiss rather less so. This variation is doubtless to be attributed to the position of the magazine



which, being below the barrel in the two former, would assist the downward cant of the rifle when loading, whereas, in the latter, in which it is in the butt, the reverse would be the case.

In the course of the experiments to test the rapidity with which the magazines could be loaded, it was found that the absence of any means of preventing the return of the cartridges when pressed into that of the Kropatschek rifle was a serious defect. It lengthened considerably the time required to charge the magazine, as the man had constantly to press on the topmost cartridge while getting another to push down the tube. The rifle was therefore modified by the addition of a catch to obviate this fault, and the further experiments were conducted with the improved rifle, which henceforth will alone be spoken of.

To place five cartridges in the magazine and one in the breech of the Hotchkiss rifle took an average of 12·18 seconds. To place six in the tube, one in the elevator, and one in the barrel of the Kropatschek, took 18·75 seconds. To load the Krag rifle with eight cartridges in the magazine and one in the barrel, an average of 21·8 seconds was required. The rate per cartridge, it will be seen, is sensibly the same for the Krag and Kropatschek rifle, but to load the former is a more fatiguing operation, as the hammer which works the breech-block has to be held back during the whole time of loading, to keep the block sufficiently depressed to permit the cartridges being pushed into the tube. The Hotchkiss rifle can be loaded decidedly more quickly than the other two.

It was next sought to compare the rapidity of fire which could be obtained, when using the rifles as ordinary breech-loaders, with that which could be got when making use of their magazine arrangements. The result is shown in the following table:—

Rifle employed.	Time taken to fire all the cartridges in the magazines in seconds.	Number of cartridges which would be fired by a battalion of 1,000 men in that time.	
		Using their rifles as ordinary breech-loaders.	Using their rifles as repeaters.
Hotchkiss. ....	14·35	3,011	6,000
Kropatschek. ....	16·84	3,590	7,000
Krag <sup>1</sup> . ....	31·71	6,194	9,000

From which we derive the fact that if  $V$  be rate at which the rifle can be fired, using the magazine, and  $v$  that obtained when it is used as an ordinary breech-loader, then—

$$V = 1·88v \text{ in the case of the Hotchkiss.}$$

$$V = 1·88v \quad \text{,,} \quad \text{,,} \quad \text{Kropatschek.}$$

$$V = 1·23v \quad \text{,,} \quad \text{,,} \quad \text{Krag.}$$

<sup>1</sup> The Krag rifle worked rather irregularly during this trial. When in good order a somewhat less time was taken to fire the cartridges.

Thus, suppose a body of men, say, a company 250 strong, to be armed with the Kropatschek, and another body of the same strength with the Gras, it will be found that, in 17·3 seconds, the time taken to empty the former rifle, the men equipped with it would have fired 2,000 rounds, while those using the latter would only have fired 1,125. "At a given moment," says the report, "such a difference might have a decisive effect." This shows also how great the advantage is of having a large magazine, which was the more strongly brought out by the following experiment.

The three rifles were fired during the time which it took to empty the magazine of that which contained the greatest number of cartridges, *i.e.*, the Krag. The time taken in this case was 25 seconds, as the Krag rifle, which had hitherto been working irregularly, now worked without any hitch. When the magazines of the Hotchkiss and Kropatschek rifles were emptied, the fire from them was continued as from an ordinary breech-loader. Before the fire was commenced, the magazine was cut off, as would be the case under ordinary circumstances in the field. When the word of command was given, therefore, to commence fire, they had to be opened. In these circumstances it was found that a company of 250 men would fire in 25 seconds—

From the Hotchkiss rifle.....	1,975 rounds.
„ Kropatschek rifle.....	2,225 „
„ Krag rifle.....	2,250 „

If the rifles were used as ordinary breech-loaders only, then in the same time would be fired—

From the Hotchkiss rifle.....	1,309 rounds.
„ Kropatschek rifle.....	1,330 „
„ Krag rifle.....	1,218 „

So that we have, by using the magazine, a gain in the case of the—

Hotchkiss rifle.....	666 rounds.
Kropatschek rifle.....	872 „
Krag rifle.....	1,832 „

As to the absolute rate of fire, the following table shows the mean rate per cartridge, and the mean time required to empty the whole magazine of each rifle:—

Rifle employed.	No. of cartridges which can be placed in it.	Mean time taken in seconds.	
		To empty the whole magazine.	To fire one round.
Hotchkiss.....	6	14·4	2·4
Kropatschek.....	8	19·2	2·4
Krag.....	9	24	2·66

As the result of the experiments we have described, the Committee concluded—

1. The magazine of the Hotchkiss rifle is the most easily and rapidly charged, that of the Krag the least so ;

2. Comparing the rapidity of fire of the three types, when used as magazine rifles, with that obtained when used as ordinary breech-loaders, the ratio with the Hotchkiss and Kropatschek is as 2 to 1, with the Krag as 3 to 2 ;

3. The rapidity of fire, using the magazine, is about equal in the Kropatschek and Hotchkiss rifles, and both are more rapid than the Krag ;

4. Other things being equal, that rifle is the best which contains the largest number of cartridges ;

5. Once the magazine is empty, it is better from the point of view of rapidity of fire to use the rifle as an ordinary breech-loader than to re-charge the magazine ;

6. The time taken to bring the magazine into play, when the rifle has previously been in use as an ordinary breech-loader, is unappreciable.

The next step that was to be taken was to ascertain that neither the shock of discharge nor the blows which the rifles might receive in the course either of drill or accidental falls, would cause the premature explosion of the cartridges in the magazine, and further, to find out whether any alteration in the shape of the bullets, which might arise in the magazine from any of the above causes, affected the shooting.

For the better carrying out of the necessary experiments, special cartridges were fabricated. Some were made with the safety cap, which, in the French cartridges, covers the percussion cap only one-half, others only one-third the usual thickness, so as to be extra sensitive, and these cartridges were filled with charcoal instead of gunpowder, to prevent accidents.

Each rifle had its magazine filled with cartridges, and then had 100 rounds fired from it, as an ordinary breech-loader, as quickly as possible. This was done three times, the first time ordinary cartridges were placed in the magazine, the second, those with safety caps reduced to one-half, and the third time, those having the safety cap only one-third of the usual thickness. No explosion took place, and on a subsequent examination it was found that, in no instance, had the fulminate been disturbed or damaged.

The magazines then being filled with regulation cartridges, 150 rounds were fired from each rifle, as an ordinary breech-loader, in two series of 100 and 50 rounds, and afterwards the magazine cartridges were fired off as quickly as possible. Next, the magazines were only partially filled and 100 rounds fired from each rifle, as above. In neither case did any accident occur, and it was evident that the cartridges in the magazine were quite secure.

The rifles were next tested to ascertain whether the shocks incident on drill or accident were liable to explode the cartridges in the magazines. Each rifle, after being charged with regulation cartridges, was subjected to the various drills, &c., to which it would be liable under ordinary circumstances, during a period of eight days, without any



accident occurring. After that the ordinary cartridges being replaced by the most sensitive ones before described, the rifles were allowed to fall from a height of five feet on to a hard stone pavement, sometimes on the butt, sometimes on the muzzle, and often the same set of cartridges was twice allowed to fall. In no case was it found that the fulminate was in the least disturbed. It was also found by experiment that not even the firing of the most defective cartridges affected those in the magazine.

With regard to the deformation of the bullets in the cartridges in the magazines under the various conditions of drill and firing, it was found that they were liable to it; but that although the alteration in form was in some cases considerable, it did not practically affect the shooting up to 450 yards, the limit of range for the use of the repeating arrangement, nor did it affect the working of the arm in so far as the Kropatschek or Hotchkiss rifles were concerned.<sup>1</sup> On the contrary, however, with the Krag, considerable difficulty was occasionally experienced in pushing the cartridge home.

The Committee concluded therefore that the cartridges might be kept in the magazines both during firing and drill without danger, and that they were not liable to explosion from any fall to which the rifle would ordinarily be exposed.

The next step was to see what influence the firing of defective cartridges would have on the mechanism of three different arms and on the cartridges in the magazine.

So long as the defect was in the body of the cartridge, it was found that practically it did not affect the rifle, nor were the escapes of gas so caused appreciable, and in no case were the cartridges exploded. A cartridge with a defective base, however, which was fired from a Hotchkiss rifle, damaged the breech arrangement very considerably, whereas neither the Kropatschek nor Krag rifles, the latter particularly, were affected under similar conditions.

It is difficult to judge, from the description at our disposal, the real reason for this difference in action between the Kropatschek and Hotchkiss rifles. Both are bolt breech-loaders, and there would seem no *primâ facie* reason why one should resist such a test better than the other. It would seem probable, therefore, that the true reason is to be found in the cartridges employed. The necessary cracks were made by filing, and it is perfectly possible that in the case of the cartridges employed in the Hotchkiss rifles, the fissures were larger than those used in the Kropatschek. It is natural to find the greatest resisting power in the Krag rifle, as in that the breech is closed by a falling block, the superiority of which, in such cases, has long been proved in England.

The rifles were next subjected to the exposure test. After having fired the defective cartridges the rifles were not cleaned for five days, and during the first three of these, 100 rounds were fired from each daily. When not in use they were left exposed to the weather and,

<sup>1</sup> The French bullet is made of pure lead compressed. If a hardened bullet were employed these deformations would not arise, or would, at any rate, be considerably less.

as there was no rain, were watered from time to time. At the end of the third day they could still be worked, but the movement had become difficult. The rifles were then taken on board the "Colbert," to expose them to the influence of the sea air. By mischance they were so placed as to receive the water dropping from the hammocks. At the end of the fifth day not one of the rifles was in working order. In the Kropatschek and Hotchkiss rifles it was exceedingly difficult to draw back the breech-bolt, and in the Krag it was extremely hard to push in the cartridge, owing to the extractor being fixed by the rust. The wooden piston-heads in the magazines of the two first-mentioned arms had become too swollen to work, but in the last-named the breech mechanism was not affected. Nevertheless no permanent injury was done to either of the three types of rifles which could not be set right by a good cleaning.

To ascertain whether the arms were affected by dust, each after firing ten rounds was exposed during four hours to a stream of fine dust, the magazines being empty and the breeches closed. After a slight cleaning with the hand ten rounds were fired from each, using the repeating arrangements, and in no case was the slightest difficulty in working discovered.

The Committee therefore concluded that—

1. Defects on the base of the cartridge are dangerous in the Hotchkiss, but present no particular inconvenience in the Kropatschek, and are harmless in the Krag rifle.

2. The Kropatschek best withstood the exposure test, but requires a metallic piston instead of a wooden one in the magazine to insure its action under all circumstances.

3. So long as the breech is closed, not one of the three is affected by dust.

Finally, it was necessary to consider the mechanism of each of the different rifles as a whole, and with reference to their capabilities of withstanding the requirements of service.

Dealing first with the Hotchkiss, this rifle was found to possess the following advantages:—Simplicity and ingenuity of construction, combined with easy manipulation and great facility in charging the magazine. On the other hand, in addition to some minor deficiencies, difficulty was sometimes found in pushing forward the cartridge into the breech when using the rifle as a repeater, and if the mechanism of the magazine got out of order it completely stopped the working of the rifle. Moreover, the rifle holds only five cartridges in its magazine and one in the breech, besides which its weight, 10 lbs. 5 ozs., is somewhat excessive.

With regard to the Kropatschek the mechanism of the breech is the same, and therefore possesses the same advantages and defects as the Gras rifle. The magazine arrangements work perfectly, and the rifle is also well adapted for use as an ordinary breech-loader. It has the advantage of holding eight cartridges. Its chief defects lie in the somewhat delicate arrangements of the elevator, in the fact that the magazine is fixed to the barrel, and must be removed with it, and in its weight, 10 lbs. 2 ozs., or 14 ozs. more than the Gras rifle.

On the whole, the Krag rifle showed itself inferior to the other two, although possessing some points in its favour; but it does not appear suited to so long a cartridge as that employed in the land service French rifle. Moreover, it had the great disadvantage of requiring each cartridge to be pushed into the breech by the hand. It must, however, be admitted that the breech mechanism is simple and strong, that the rifle, while weighing no more than the Gras, holds nine cartridges.

Finally, the Committee had to determine whether a magazine rifle was suited for the Navy, and if so, which of the types submitted was the best to adopt.

On this first point their reply was a unanimous affirmative. They point out that for use in the tops, on the quarter-deck, or forecastle, repeating rifles possess undoubted advantages, as enabling a small number of men to pour in a powerful fire. For similar reasons their employment is advantageous in the case of the guard on board a ship at anchor and for the crews of the guard boats rowing round it. Again, the numerical inferiority of a prize crew, or of any detachment which might be landed to hold an important point, points to the desirability of giving the men the most powerful armament procurable.

With regard to which of the three types submitted was the best for adoption, the Committee considered that on the whole the Kropatschek was the best adapted for use in the French Navy. The Krag was unsuited because, as we have seen, it did not seem feasible to employ a long cartridge with it, and because it was somewhat slower in its action than the other arms. The Hotchkiss was in many ways superior to the Kropatschek, especially in point of simplicity, and the smaller number of pieces involved in its construction. On the other hand, the magazine in the butt being short, necessarily contains fewer cartridges than when it is placed below the barrel; and it was found that if the magazine mechanism were impeded, the arm could not be used even as an ordinary breech-loader, a fault from which its rival was entirely free.

The Kropatschek, although more complicated and possessing in the elevator, with the spring cartridge check of the magazine, a rather delicate mechanical arrangement, had worked perfectly during the trials. It possessed, moreover, the advantages of being similar in its manipulation and breech apparatus to the Gras rifle, and could be made to hold nine cartridges, viz., seven in the magazine, one in the elevator, and one in the barrel. In their report, therefore, dated 29th March, 1878, the Committee proposed the introduction of the Kropatschek rifle holding nine cartridges as above, and on the 28th June their recommendation was approved by the Minister of Marine and henceforth the French Navy will be armed with a repeating rifle.

The trials made were exhaustive, for each rifle had fired 10,000 rounds of blank and about 2,000 rounds of ball cartridge, and on the whole there is no objection to be made to the opinion expressed by the Committee. There can be no doubt that in many ways the Kropatschek was the best of the three rifles submitted to them. The Krag is undoubtedly the least efficient, and the soundness of its rejection is



undeniable. On the other hand, it must be remembered that both of the others as tried were much heavier than in English opinion a rifle should be. The Martini-Henry weighs only  $8\frac{1}{2}$  lbs., the Hotchkiss and Kropatschek about 10 lbs. 5 ozs. each. Now, if the last two rifles had their weight brought down to a reasonable amount, say 9 lbs. 4 ozs., the weight of the Gras, it would be found that with the magazines fully charged, the Hotchkiss rifle would be much better balanced than the Kropatschek, no unimportant advantage so far as accurate shooting is concerned. Since the trials in France the former arm had been considerably improved and still more simplified, the defects which then became evident having been entirely removed. The sole disadvantage remaining, is the smaller number of cartridges that can be placed in the magazine, and it would be a question, therefore, whether this alone would render nugatory its otherwise undoubted superiority. In the eyes of the United States Army this is not the case, for they propose to introduce the Hotchkiss rifle, and personally we believe that they are right in their determination.

The repeating rifle in use in the Norwegian Navy is the Krag-Petersen, and is substantially the same as the Krag rifle, already described, so far as its mechanism is concerned, and is distinguished from it only by its superior calibre, viz., .539 inches. The rifle weighs 9 lbs. 7 ozs., and is 4 ft. 3 ins. long. The cartridge is a rim-fire, and contains a ball weighing 366 grains with a powder charge of 66 grains. This rifle cannot be considered as at all up to the requirements of a modern weapon. The calibre is too large, the bullet light, and the powder charge small. Its sole redeeming feature lies in its magazine arrangement. It contains nine cartridges which, with one in the barrel, make ten as total number of rounds which can be fired without loading the arm. Judging from an account of some comparative experiments which took place in Sweden, it is neither so accurate nor so rapid as the Mauser rifle. Thus in firing at a target 6 feet high by 4 feet wide from a distance of 500 paces, the German rifle fired 10 rounds in one minute, hitting each time; whereas the Norwegian rifle, firing 10 rounds in 55 seconds, made only 9 hits. In a trial for rapidity at a moving mark the Mauser fired 10 rounds in 45 seconds, hitting 4 times; the Krag-Petersen required 50 seconds to fire the same number, and struck the target only twice. These results are not as good as were obtained by the French Committee (see *ante*, page 1094); but it would seem that, at any rate, the Krag-Petersen is not entitled to rank very high among modern small arms.

The Kropatschek has, as we have already said, been tried in Austria. Experiments which have lately been made, go to show that it is a superior weapon to the Werndl rifle hitherto in use in that country, and that, even when used as an ordinary breech-loader, it is more rapid in its action. At present, however, it is not likely to be introduced into the service. The War Minister proposes now to improve the Werndl by enlarging its chamber, so as to take a larger cartridge, and it is improbable, therefore, whatever its advantages, that the Kropatschek will be adopted in its place.

The Winchester rifle used by the Turkish cavalry may be seen in the

museum of the Institution. It weighs 8 lbs. 8 ozs. and is 3 ft. 10 ins. long. It can be used either as a repeater or as an ordinary breech-loader. The magazine is placed below the barrel, and holds sixteen cartridges. The bullet weighs 200 grains and the powder charge is 40 grains. The disadvantages of this weapon are its great complexity and its small cartridge. This latter fault has been remedied in the latest pattern brought out by the Winchester Repeating Arms Company, but the former still exists. It must, however, be admitted that it did good service during the late war. It can be used as an ordinary breech-loader or as a repeater at will. To open the breech, the trigger-guard is pressed forward, as in the Martini-Henry, by which means the hammer is brought to full-cock, the old cartridge-case rejected and a fresh cartridge brought up by the elevator into position opposite the rear end of the barrel. When the trigger-guard is brought back, this is pushed into the breech and the weapon is ready to fire. An opening is made in the right side of the stock below the breech-bolt, through which the cartridges can be introduced into the magazine.

The Fruwirth rifle, with which the Austrian gendarmerie and Tyrolean mounted rifles are armed, is very similar in its mechanism and action to the Kropatschek, which latter may indeed be considered an improvement on it. It measures 3 ft. 4 $\frac{3}{4}$  ins. and weighs 8 lbs. 1 oz., fires a cartridge having a bullet weighing 313 grains with a powder charge of 33 grains. Eight cartridges are carried in the arm, viz., six in the magazine, one in the elevator, and one in the barrel. The magazine is charged in the manner described for the Kropatschek rifle, and it is said that it can be done in twelve seconds. The eight rounds can be discharged in sixteen seconds. This rifle even according to Austrian accounts is not a first class weapon. It is complicated, fires too small a cartridge, and is difficult to work as an ordinary breech-loader.

The Swiss Vetterli repeating rifle is interesting as forming the weapon of the only infantry which is armed completely with a magazine arm. It is in outward appearance much like the Kropatschek or Hotchkiss rifles, except that the breech-handle is placed further back. It is 4 ft. 6 $\frac{1}{2}$  ins. long, weighs 10 lbs. 8 ozs., fires a rim-fire cartridge, with a bullet weighing 310 grains and a powder charge of 55 grains. It can be used either as an ordinary breech-loader or as a repeater. The magazine, which is placed below the barrel and holds eleven cartridges, is loaded from the right side of the breech, as in the Winchester repeater. The chief advantage of this rifle lies in the large number of cartridges it contains, viz., thirteen altogether. Its initial velocity is 1,427 feet, so that for short distances its trajectory is flat. Beyond close ranges, however, its light bullet rapidly loses velocity, and its accuracy, therefore, cannot be very great. It is, moreover, extremely complicated in its mechanism, and altogether, although a great advance at the time it was introduced, is now fallen into the second rank of weapons.

From the foregoing pages we think it will be seen that of all the types described, the Hotchkiss and the Kropatschek are by far the best, and that by the introduction of the latter into the French Navy, an

armament has been obtained which is in all points equal, and in many superior to, that of any other nation.

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## NOTICES OF BOOKS.

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*Histoire de la Guerre de Crimée.* Par Camille Rousset, de l'Académie Française. Paris : Hachette et Cie., 1877. 2 vols. and Atlas. Price 22fr. 50c. Size, bound and complete, 9' x 6' x 3". Pp. 934.

THE work now before us is dedicated to General Trochu, who went out to the East in the spring of 1854 as first aide-de-camp to Marshal St. Arnaud, and was kept on the head-quarter staff by that Officer's successors, only quitting it in June, 1855, to take command of a brigade, which he led to the final assault on the 8th September, when he fell severely wounded at the foot of the "Central Bastion." General Trochu, since become a historical character, enjoyed the entire confidence of the three Generals who in succession commanded the French Army in the East, and was thus completely behind the scenes. His name, therefore, gives of itself a certain stamp of authority to M. Rousset's work. The author was engaged in historical researches at the French War Office during the years 1854-55. He could not fail to be deeply impressed by the feelings of those around him, whose minds were fully occupied with the great drama which was being played out on the shores of the Black Sea; he then and there, as he tells us, resolved to write the history of the Crimean War, a resolution confirmed by subsequent conversations with his friend General Trochu, after the latter returned from the seat of war. He had, as the contents of his work show, access to the official documents and to the correspondence, both official and confidential, which passed between the Emperor of the French and his Minister of War on one side, and the French Commander-in-Chief and other Officers at the seat of war on the other.

Whether these documents, which give a special value to his work, were communicated to him by General Trochu, or whether he met with them at the War Office, we know not; but of this we have no doubt, that M. Rousset's work would never have appeared had the Empire lasted, containing as it does matter, the publication of which would have been extremely distasteful to the Imperial Government. To this, probably, more than to any other cause is due the delay in bringing out the work, a delay not to be regretted, as it has enabled the author to sift his materials with greater care, and perhaps also has allowed any undue heat of feeling which might have been betrayed at an earlier period to evaporate.

The result of the author's labours is one of the most important contributions towards a history of the Crimean War which has yet appeared; indeed, setting aside the technical accounts of the siege of Sevastopol which have been published by the War Departments of England, France, and Russia, and which are, as far as they go, exhaustive, we think the most important of all, its special value consisting not only in the revelations to which we have before alluded, but in the almost total absence of prejudice, either national or individual, shown by the author, whose work in that respect shines out in happy contrast with that of one of our own countrymen, to which he alludes more in sorrow than in anger. M. Rousset is clearly no admirer either of the Emperor Napoleon or of his system, but he never speaks of either in an unbecoming manner; he is evidently a thorough Frenchman, fully appreciating the prowess and other good qualities of his countrymen; still he does not spare them when he thinks they are to blame, and whilst he does them full justice he is rarely, and we are convinced never wittingly, unjust either to their allies or to their enemies.



In short, there is a total absence of what our neighbours call "*chauvinism*," and what we shall probably in future call "*Jingoism*," rarely to be remarked in the chronicles of war, especially when written by the author's countrymen. In addition to the merits of calmness and impartiality, M. Rousset has that of a clear and vigorous style, and though he is fortunately not given to fine writing, his narrative becomes on occasion animated, picturesque, and graphic. His work contains but few purely technical details, and is on that account all the more likely to be acceptable to the general reader; whilst the light which it throws on certain dark phases of the war, and on the relations between the allies, recommend it to the military student. It is accompanied by a small atlas containing very fair maps and plans.

Valuable as this work is, however, it is far from being a complete picture of the Crimean War; it is only a good sketch taken by a clear-sighted, honest, and impartial observer from one point of view. A complete history of this great contest has not yet been published, and probably it will not fall to the lot of the present generation to read one; but the time will come when the whole truth may be told without offence to nations or individuals. Then the history of the Crimean War will at last be written, and works such as that now before us will be of great value to the future historian. Meanwhile, though we do not find all we want in M. Rousset's pages, we find much that is new and suggestive.

The author brings vividly before us the dangers and difficulties arising from divided command—dangers and difficulties to a great extent inevitable when the armies of two great nations fight side by side against a common foe, and in the present case greatly increased by the constant interference of the French Emperor—a would-be strategist, who was from the first too much inclined to meddle with the conduct of the campaign, and who when dissuaded later on from putting himself at the head of his Army in the Crimea attempted to direct its movements from Paris, the electric telegraph, then a novelty in war, giving him dangerous facilities for the purpose. Had it not been for the stubborn and courageous opposition of General Félissier, supported by the tact and good feeling of Marshal Vaillant, the Emperor would have probably saved Sevastopol for the Czar, and have broken up the Anglo-French alliance. We all knew long ago that the two great Powers which headed the alliance against Russia did not always pull together as well as could be wished, but few, we think, were aware before the publication of M. Rousset's work how often the alliance was in jeopardy, how near it was to total wreck at the beginning of July, 1855, and how much both France and England owe to the French Commander-in-Chief and to the French Minister of War.

Sometimes the Emperor's meddling activity took a turn which was more ludicrous than dangerous. For instance, Marshal Vaillant wrote on the 3rd February, 1855, to General Canrobert, then commanding:—"The Emperor orders me to send you 4,000 cuirass fronts made so as to cover and protect the chests of our infantry soldiers when mounting to the assault." The Czar was early informed of this brilliant conception of his Imperial cousin, and mentioned it in rather a sarcastic manner in a letter to Prince Menchikoff, dated February 12th, 1855. The 4,000 steel corslets arrived in the Crimea and were issued to the two French Army Corps, but were never used; and, as M. Rousset says with sly humour, "*L'on fut généralement d'avis de garder sur ce sujet délicat un silence prudent.*"

Napoleon's mind was evidently at that time much occupied with cuirasses,—which he was more successful in applying to naval than to military purposes, witness *Kinburn*.

Napoleon was one of the not uncommon class of despots who could not confide in the General of his selection. On two occasions he sent out Officers to the Crimea on a confidential mission to report upon the conduct of the campaign, with which he was not satisfied. These Officers, of course, corresponded directly with him and with the Minister of War; and what is more surprising, other Officers of the Crimean Army appear to have been encouraged to criticize the actions and conduct of their superiors, including the Commander-in-Chief, and to communicate their opinions privately to the authorities at Paris. Hence arose a system of backbiting and intrigue, which must have been very damaging to discipline and very demoralizing to the Army.

The more we read and reflect about the Crimean War, the more we are impressed

by the difficulties which caused the great triumph to be so long delayed (difficulties partly inherent in the undertaking, partly caused by want of preparation and bad management), and the more thankful we are that the allies got so well out of it.

We will give two more extracts selected from many passages of a similar nature to show how well inclined M. Rousset is to do justice to the British Army, whose shortcomings in the campaign he however also points out. After describing the failure of the French artillery in the first bombardment, on 17th October, 1854, and the gallant, steady, and successful efforts of the British gunners, he says, "Thus the English artillery had gained at this point a brilliant success, and we may say that it only rested with Lord Raglan to convert that success into decisive victory. The great Redan was for several hours on that day indefensible and at his mercy. . . . The English Army has reason to remember with pride many a deed of valour and many a day honourable to its annals during the siege of Sevastopol; but once only, and that on the 17th October, it was upon the point of gaining a triumph unshared by its allies."

Again, towards the end of his work, M. Rousset quotes the following remarks of "un bon observateur" who was present at a review of the English Army in the Crimea in February, 1856, when about 50,000 men were under arms, the largest force of native British troops which ever mustered in the field.

"England has proved that it could raise, instruct, and discipline in less than a year an Army of 50,000 men almost equal to the best troops in the world. If the war is renewed they will make up brilliantly for their want of success in the final assault on Sevastopol, for their superiority over what they were at that time is immense, both in respect of numbers and on account of their eagerness to measure themselves with the Russians. They have made wonderful progress;" M. Rousset adds, "as for the Navy, England had only herself to surpass, and she has done so."—L. G.

*Rapport sur l'Armée Allemande*, adressé à S.A.I. Le Grand-Duc Nicolas. Par le Colonel Baron Kaulbars, de l'Etat-Major Russe, au retour de sa Mission Militaire à Berlin (1875-76). Traduit du Russe avec l'Autorization de l'Auteur. Par G. Le Marchand, Capitaine au 15e d'Artillerie. 1 vol. Paris: Librairie Militaire de Berger-Levrault et Cie. Paris, 1878. Price 6 francs. Size 7½" x 5" x 1½". Pp. 677. Weight 1 lb. 10 ozs.

To any one who wishes to get behind the scenes and to learn the inner working of the German military system, we cordially recommend this book. Colonel Kaulbars is an enthusiastic soldier, and has hit off those points which will be of most value and of deepest interest to his professional readers. He paints in great detail, but in a pleasant and readable style, the inner lives of Officers, non-commissioned officers and soldiers, and brings most vividly before the eye the training which has made the German Army what it is. Possibly the Colonel is an optimist, and has passed over in judicious silence the less pleasant features of a German soldier's career; but making allowance for exaggeration, the book bears the impress of truth. The writer of this notice recently had an opportunity at Metz of testing some of Colonel Kaulbars' statements, and the result was most satisfactory. No point does the Colonel bring out into stronger relief than the independence and the responsibility enjoyed by the company and squadron leaders, and the absence of meddling centralization. The writer cannot refrain from relating as a striking illustration of this characteristic in the German Service, and in confirmation of the view of it taken by Colonel Kaulbars, an incident which came under his personal observation. In July last a brigade of cavalry was being exercised in swimming the Moselle. One of the troop horses was drowned and floated away down the stream. Nobody appeared particularly excited about the matter. In answer to a question, one of the Officers remarked that probably the saddle and equipment would be recovered, but it was not an incident calling for special notice. Enquiries were then made as to the course which would be pursued with regard to this accident; how many boards of inquiry would be convened for the purpose of investigating, &c. (it must be remembered that the questioners were English Officers). The answer may be thus epitomised, and we give

it without comment. "Boards of Inquiry? None. The squadron leader will return 'the horse 'drowned at swimming exercise.' That is all. If nineteen horses had been 'drowned, and the return had shown this number of casualties, the query would 'have come down from the authorities, were proper precautions taken to prevent 'accidents?'" As Colonel Kaulbars points out, the efficiency of the squadron is a matter which depends on the squadron commander, and not until the regular period arrives for testing the efficiency will any interference with the commander be tolerated. It is much to be regretted that owing to the limited demand for military literature in this country it is not likely that the report will be translated into English; but appearing in a French dress, and issued at an extraordinarily low price, it will, it is to be hoped, find many readers in this country.—L. A. H.

*Notes on Individual Equipment for the East.* From Personal Experiences. By Captain T. Fraser, R.E. Mitchell. London, 1878. Price 6d. Pamphlet. Pp. 19.

PREFACE. "The following notes on equipment have been put down on the chance 'of their being of use to others. They are based on the experience of many months 'lately spent in European and Asiatic Turkey during summer and winter.

"To the notes has been added a list of what has been found useful, and to save 'inquiries, and also the time of those who may have to get their kit in haste, other 'particulars have been given where it appeared desirable."

*La Fortification du Champ de Bataille.* Par le Général A. Brialmont, Inspecteur-Général des Fortifications et du Corps du Génie de Belgique, avec un Atlas de dix-neuf Planches. 1 vol. Bruxelles: Librairie Militaire C. Murquardt. 1878. Price 13½ francs. Size 9" x 6" x 1½". Pp. 415. Weight under 2½ lbs.

THE author tells us that this work is a complete treatise, which will not require modification for a long time, because he has taken into account both the experiences derived from the last wars and also the recent treatment of the question of field engineering in the schools of Germany, France, Austria, and Belgium.

General Brialmont stands among the first engineers in Europe as an authority on Permanent Fortification, but when he writes on Field Fortification he has to submit to those conditions which render the satisfactory treatment of the subject as impossible to him as it is to the many other military men who have essayed the task; viz., the transitional state not only of tactics but of armament, and its most advantageous employment. It is, therefore, no act of presumption on our part, if, whilst recommending this book as a valuable contribution to military literature, we add the caution that the conclusions contained in it should be carefully weighed and considered before they are accepted.

General Brialmont himself seems to feel the unstable nature of the foundations on which he has constructed his edifice, for, when comparing the heroic defence of Plevna with the feeble resistance offered at Kars, he recalls the old adage and admits its truth, "*Tant vaut l'homme tant vaut la place*," (p. 356); and, dealing with the same topic, he writes, at p. 352, "This proves that identical results can 'be obtained by the employment of different means when these means are justified 'by a judicious appreciation of the physical and moral conditions of the opposing 'forces and their Generals; a fresh confirmation of the truth that war is not an 'exact science but an art, which requires for its exercise a natural aptitude which 'work renders fruitful and experience ripens."

The keystone of defensive warfare of the future lies, according to General Brialmont, in the free use of closed works, of which he gives three types; the first garrisoned by a company of infantry, 200 strong, the second by two companies and a battery of artillery, the third by a battalion. The only cases in which artillery should not be placed in redoubts, are those where very good (*très bons*) positions for batteries are found in their neighbourhood (p. 351). The General does not, however, intend that these guns should take part in the earlier stages of



the combat, but he would reserve their fire until the struggle comes to close quarters. In the defence of localities the same predilection for redoubts recurs.

The book will doubtless be extensively studied; but not a few points in it will meet with criticism, such, for instance, as the proposal to place batteries in tiers, p. 164; the allotment of six to eight men per metre in an average position, p. 178; the maintenance of the idea of shock tactics, p. 179; and, lastly, the very extensive use of destroying houses by demolition or burning, recommended in the defence of localities.

The notes on the late campaign, with the plans of the works constructed during it, will be found very interesting. L. A. H.

*The Operations of War.* Explained and illustrated by Edmund Bruce Hamley, Major-General, late Commandant of the Staff College. Fourth Edition. 1 vol. Blackwood and Sons. Edinburgh and London, 1878. Price 30s.<sup>1</sup> Size 10" × 8" × 2". Pp. 491. Weight under 4½ lbs.

THE fourth edition of this work shows that General Hamley does not intend to allow it to become antiquated or behind the times. There are certain portions of the work which, from their standard character, might almost be stereotyped, such as those which describe the strategy of campaigns, but even here the hand of the careful reviser is apparent.

There is, however, one matter prominently brought forward in this edition, and on which it seems desirable to offer some remarks. We refer to General Hamley's comments on the conduct of Bazaine on the 17th August, the day after the Battle of Vionville, and on the line of action which he considers open to the Marshal. General Hamley suggested in the third edition of his great work, that Marshal Bazaine might, on the 18th August, have broken out of Metz in a south-easterly direction on the right bank of the Moselle, across the German communications; and he further said—"That the 17th was a day on which the French were absolutely free to execute their designs without molestation, is shown by the fact that on the 18th the German Second Army advanced for hours in a wrong direction before discovering the French position."

This view of the question was at once combated by Colonel Sir Lumley Graham, in a letter which appeared in *The Army and Navy Gazette* of the 22nd March, 1873, and an interesting correspondence between Colonel Graham and Colonel Hamley resulted. Sir Lumley's arguments do not appear to have carried any weight with his opponent, for in the present edition we find the theory again brought forward in its integrity. Although we have, after most carefully investigating the situation by the light of official and other documents, formed a very strong opinion adverse to the practicability of the proposed movement, and also to the correctness of some of the premises on which General Hamley founds his arguments, we willingly allow that it is a case about which independent investigators may arrive at different conclusions: but we cannot pass over, without comment, the fresh note at p. 332, in which the views of the Germans themselves are brought forward as incidentally supporting General Hamley's theory.

There is also, we know, a widely-spread notion that the theory in question is supported by the published views of the German General Staff. Our chief object in offering for consideration the following remarks is to show that this idea is a delusion; that General Hamley's theory, be it right or wrong, derives no support from the German Staff critics, who in the passage referred to by General Hamley are considering a totally different military situation.

The Germans admit, in fact (p. 533, vol. i, Clarke's "Translation of the Official Account of the War"), that on the 31st August, the day of Noisseville, Bazaine could "in view of the position at that time of the Investing Army," have broken out in a south-easterly direction.

General Hamley writes:—"If the chances in favour of Bazaine's supposed

<sup>1</sup> It should be mentioned that the book can be obtained at the Army and Navy Co-operative Stores for 22s. 6d.

"attempt were at that time so great, how much greater would they have been on the 17th (*sic*), when the Germans were scattered and unprepared for resistance on that side! In other respects, the above description of the operation in the German official account is a curiously exact abstract of that proposed in detail in the text." The 17th is here given as the day for the attempt, whereas in the text this day is consumed in bringing back the French Army across the Moselle, and the 18th is the day named for the sortie. It is evident that the latter is the day intended.

Leaving out of consideration the facts that the 17th was a bright and clear day, and that during the afternoon the artillery of the 1st Corps were firing into Metz from the south-east, and, therefore, that in all probability the movements of the French would have been seen and their intentions discovered; we would ask any one interested in the question, to place on the map the German troops, first in the positions they occupied at 3.30 A.M. on the 18th (the hour and day fixed by General Hamley for the commencement of the movement); and second, in the positions they occupied on the 31st, and then let him draw his own conclusions as to the correctness of the inference in the note.

At pp. 4 and 5 of vol. ii of the "Translation of the German Official Account of the War," will be found the positions of the troops on the right bank, and in the note on p. 6, the positions of those on the left bank of the Moselle at 3 A.M. on the 18th. The positions of these same troops on the 31st, minus the Guards and the Saxons and four Cavalry Divisions, who had gone to the west, will be found at pp. 473, 485, 486, 487, 493, and 494 of the first volume, and on the map showing the positions occupied by the investing troops on the 27th August.

The subjoined table shows the positions of the corps on the two days in question:—

3 A.M. 18th August.		31st August.	
1st Corps.	Concentrated at Courcelles-sur-Nied and Laquenexy, S.E. of Metz.	..	Extended from Failly to Laquenexy about 5½ miles.
2nd "	Had set out one hour previously from Pont-à-Mousson for Buxieres.	..	Neighbourhood of Briey, Valleroy, and Auboue, 12 miles N.W. of Metz.
3rd "	Vionville and Buxieres	.. ..	Between Conflans and Doncourt.
7th "	Concentrated at Ars and neighbourhood.	..	From Pouilly to W. of Vaux, 6 miles.
8th "	Concentrated at Gorze, 31st Brigade at Arry.	..	Extended from Rozerieulles to Saulney, 7½ miles.
9th "	Flavigny	.. .. .	Pierrevillers and Montois la Montagne, N.W. of Metz.
10th "	Tronville	.. .. .	Semecourt and Maizieres, N. of Metz.
12th "	Mars-la-Tour & Puxieux.	}	No longer with the Army.
Guard.	Hannonville.		
3rd Res. Div.	Not joined	.. ..	Malroy, N. of Metz.
1st Cav. Div.	Corny, S. of Metz	.. ..	Habonville W. of Metz.
3rd "	Coin les Cuvry between Moselle and Seille Rivers.	}	On both banks of Seille.
5th "	Tronville.		
6th "	Vionville.		
Guard (less one brigade)	Tronville and Hannonville.	}	No longer with the Army.
Sax. Cav. Division.	Parfondrupt.		

The tactical portion of the work has been thoroughly revised, and the views of outposts differ *in toto* from those given in the previous editions, being a brief epitome of General Hamley's pamphlet on the subject.

L. A. H.

*Manuel du Soldat d'Infanterie.* Publication de la Réunion des Officiers. Tanera. Rue de Savoie. Paris, 1878. Price 75 centimes. Weight under  $3\frac{1}{2}$  oz. Size  $3\frac{1}{2}'' \times 5\frac{1}{4}'' \times \frac{1}{2}''$ . Pp. 175.

IN the form of question and answer the whole duty of an infantry soldier is drawn up in simple language, under the heads of the profession of arms, interior economy, maintenance of arms, firing, garrison duty, railway transport, field service, hints on sanitary matters. It is much to be wished that some little manual of this character were put together and circulated in our own service, at a price within the means of the private soldier. In this latter respect we have much to learn from Continental publishers.

*Les Transformations de l'Art de la Guerre.* Publication de la Réunion des Officiers. Tanera. Paris, 1878. Price  $2\frac{1}{2}$  francs. Weight under 7 oz. Size  $9'' \times 5\frac{1}{2}'' \times \frac{1}{3}''$ . Pp. 136.

A BRIEF sketch of the progress made in various branches of military art, such as the formation of armies, logistics, tactics, strategy. Although interesting there is not much that is new in this work.

*Renseignements sur l'Artillerie de la Marine et sur l'Artillerie de Côte de l'Italie.* Par M. H. de Poyen, Chef d'Escadron de l'Artillerie de la Marine. Tanera. Paris, 1878. Price 3 francs. Weight under  $4\frac{1}{4}$  oz. Pamphlet. Pp. 48.

THIS work is of special interest to Naval Officers, giving as it does full details of the artillery employed by Italy, in her fleet and on her coasts.

*Renseignements Sommaires sur l'Artillerie Danoise.* Tanera. Paris, 1878. Price 2 francs. Weight under 3 oz. Pamphlet. Pp. 40.

AN account of the artillery used in the Danish service; naturally it is not of the same importance as the work last noticed.

NOTE.—The works published by M. Tanera can be obtained either direct from him by Post-Office Order payable at Paris, or through Messrs. Dulau, 37, Soho Square, London. M. Tanera's address is Rue de Savoie, 6, à Paris.

*Dislokations-Karte der Kriegsmacht des Deutschen Reichs im Frieden.* Entworfen nach den besten Quellen. Von E. von Tröltzsch, Hauptmann. Stuttgart. Verlag von Karl Aue. 1879. Price 6s. Size  $3' 6'' \times 2' 8''$ . Weight under 8 oz.

THIS is a valuable map, on a scale of  $\frac{1}{1700000}$ , showing the positions of the naval and military forces of Germany in peace time. In some instances the position of single squadrons is shown.

*Jahresberichte über die Veränderungen und Fortschritte im Militairwesen.* Vierter Jahrgang, 1877. Mittler. Berlin, 1878. Price 7s. Size  $9\frac{1}{4}'' \times 6\frac{1}{4}'' \times \frac{3}{4}''$ . Pp. 412. Weight under 1 lb. 3 oz.

THIS résumé of the work done in the military world during the year 1877, both in the field or in preparation for the field, is very valuable and deserves careful perusal. The scope of this publication was fully explained in No. 87 of this Journal. Colonel von Löbell still retains the editorship.



*Military Sketching and Reconnaissance.* By Lieutenant-Colonel F. J. Hutchinson and Captain H. G. Macgregor, being the first volume of Military Handbooks for Regimental Officers, edited by Lieutenant-Colonel C. B. Brackenbury, Superintending Officer of Garrison Instruction. London: Kegan Paul & Co. 1878. Price 6s. Size  $6\frac{1}{4}'' \times 4\frac{3}{4}'' \times \frac{1}{2}''$ . Pp. 121. Weight under 8 oz.

FROM the preface we learn that this is a "really elementary book." It is intended for Officers who do not want to become surveyors.

Amidst the chaos of existing systems of sketching and of text books on the subject, it is difficult to fix the exact relative value of this little work.

All these attempts to diffuse information are valuable. At p. 109, &c., is a course of field sketching, reconnaissance of ground for non-commissioned officers of infantry, cavalry, and artillery. This course is, in our opinion, too extensive and might judiciously be cut down.

*A Primer for Horse, Field, and Mountain Artillery.* By T. H. Lloyd, Captain Royal Artillery. Boddy: Woolwich, 1878. Price 1s. 8d. Size  $7\frac{1}{2}'' \times 5'' \times \frac{1}{4}''$ . Pp. 64. Weight under 5 oz.

ANOTHER useful and simply written work to facilitate the instruction of non-commissioned officers and gunners of horse, field, and mountain batteries.

*L'Année Militaire.* Revue Annuelle des faits relatifs aux Armées Française et Étrangères. Première Annexe. 1877. Paris: Librairie Militaire, Berger, Levrault, et Cie. 1878. Price 4 francs. Size  $7\frac{1}{2}'' \times 4\frac{3}{4}'' \times 1\frac{1}{2}''$ . Pp. 542.

THIS work is similar in character to that edited in Germany by Colonel von Löbell. It is avowedly incomplete in this its first year of issue, but if the editor can, in succeeding years, bring it up to the standard set by Colonel von Löbell, he will have rendered an invaluable service to those to whom German, if not a sealed book, is a language to be read with difficulty only.

*The History of the Honourable Artillery Company.* By Captain G. A. Raikes, 3rd W.Y.L.I. Militia, Lieutenant-Instructor of Musketry H.A.C., Author of "Historical Records of the First Regiment of Militia." Vol. 1. R. Bentley & Son. London, 1878. Price 31s. 6d. Size  $9'' \times 6\frac{1}{2}'' \times 2\frac{1}{2}''$ . Pp. 491. Weight under  $3\frac{1}{4}$  lbs.

CAPTAIN RAIKES is making good use of his connection with the Artillery Company, towards continuing his histories of the reserve forces.

This volume is full of interest and is plentifully furnished with excellent maps and illustrations.

*The Armies of Asia and Europe, embracing Official Reports on the Armies of Japan, China, India, Persia, Italy, Russia, Austria, Germany, France, and England.* By Emory Upton, Brevet Major-General United States Army. New York: D. Appleton & Co. 1878. Price 14s. Size  $9'' \times 6\frac{1}{4}'' \times 1\frac{1}{4}''$ . Pp. 385. Weight 1 lb. 12 oz.

GENERAL UPTON was, in June, 1875, commissioned by the Secretary of War of the United States to proceed, accompanied by two other Officers, to the Old World, to examine and report upon its Armies. Denmark, Norway and Sweden, Spain and Portugal were not, however, to be included in the examination. The task was a gigantic one; but it would seem, from the letters of instructions given in the first pages of the volume, that Asia, with the European rival Powers contending therein, was the field about which most information was wished for. More than a third of the book is devoted, therefore, to the Armies of Japan, China, India, and Persia.

The whole book, which, however, contains only that portion of the report already issued, gives, in a comparatively small space, a great amount of valuable information extremely useful for reference. General Upton's conclusions also merit careful study. Special reports on cavalry and artillery are promised.

*Tir Incliné de l'Infanterie.* Par E. Paquié, Chef de Bataillon au 40<sup>me</sup> Régiment de Ligne. Paris: Dumaine. Price 4 francs 50 cents. Pamph. Pp. 249.

*Des Effets de la Mousqueterie selon le Terrain et les Formations.* Par V. Legros, Capitaine au 43<sup>me</sup> Régiment de Ligne. Paris: Tanera. Price 2 francs. Pamph. Pp. 102.

ALTHOUGH the youngest born of the children of military art, long-range infantry fire already possesses quite a literature of its own. Besides the works of Horsetsky, von Hornthal, Grossmann, Tellenbach, Boguslawski, and others, which deal with the general question, a lively discussion has been going on for some time in France as to the manner in which its introduction has affected the occupation of ground, and more especially as to the value of commanding positions for the defence.

This discussion arose originally from a sentence in the *Manuel de l'Instructeur de Tir*, which runs:—"Fire directed from low against high ground will sometimes present certain advantages. If the enemy occupies a plateau, every bullet which grazes the crest will sweep the surface over a zone often very extensive."

Taking this for his text, Major Paquié has written his book to show that, under no circumstances is high or dominating ground advantageous to the defence, and that one of the chief causes of the French defeat in the war of 1870-71 was their habitually choosing the crests of such positions for their principal line of defence.

Although we may not agree with the author in the whole of what he says, there can be no doubt that he has thrown considerable light on many points connected with the occupation of ground, and that, in a great degree, what he states is true. He considers that the *chief* line of defence should not be placed on the crest, because, although such a position is favourable for seeing and firing on an enemy so far as the front line of infantry is concerned, yet the supports and reserves in rear would also be within the effective sphere of fire. Moreover, that artillery so placed come too quickly within the range of infantry fire. He concludes, therefore, that the true front of the position is to be found from 500 to 800 yards in rear of the crest, and that it will be better if the ground slopes gently down towards it from the crest itself.

Such opinions are doubtless opposed in great measure to what has hitherto been believed and taught on the subject; our space does not permit us to more than thus briefly indicate the scope of our author's work; but we can recommend it to our readers as a clear and well written statement of his side of this question.

Captain Legros takes the opposite and hitherto more generally held view on the subject. His arguments are also plausible and well put, but are not couched in the same simple language as his opponent's. However, the two works should be read together, in order to come to a fair conclusion on this extremely important question—one which cannot be too quickly argued out and settled.

The second part of Captain Legros' brochure deals with the question of infantry formations as affecting loss. It may be looked upon as a technical extension of Major Tellenbach's well known pamphlet "On the art of manœuvring under the enemy's fire with as little loss as possible," and is, so far as we are aware, the only work of the kind in existence.

It is, doubtless, difficult to theorise on such a subject as this; but, to come to any just notions as to the best formation for attack, it is evidently necessary to deal with it; and if our author has erred somewhat on the side of theoretical detail, he has nevertheless contrived to throw a good deal of light on a very important question.

W. H. J.

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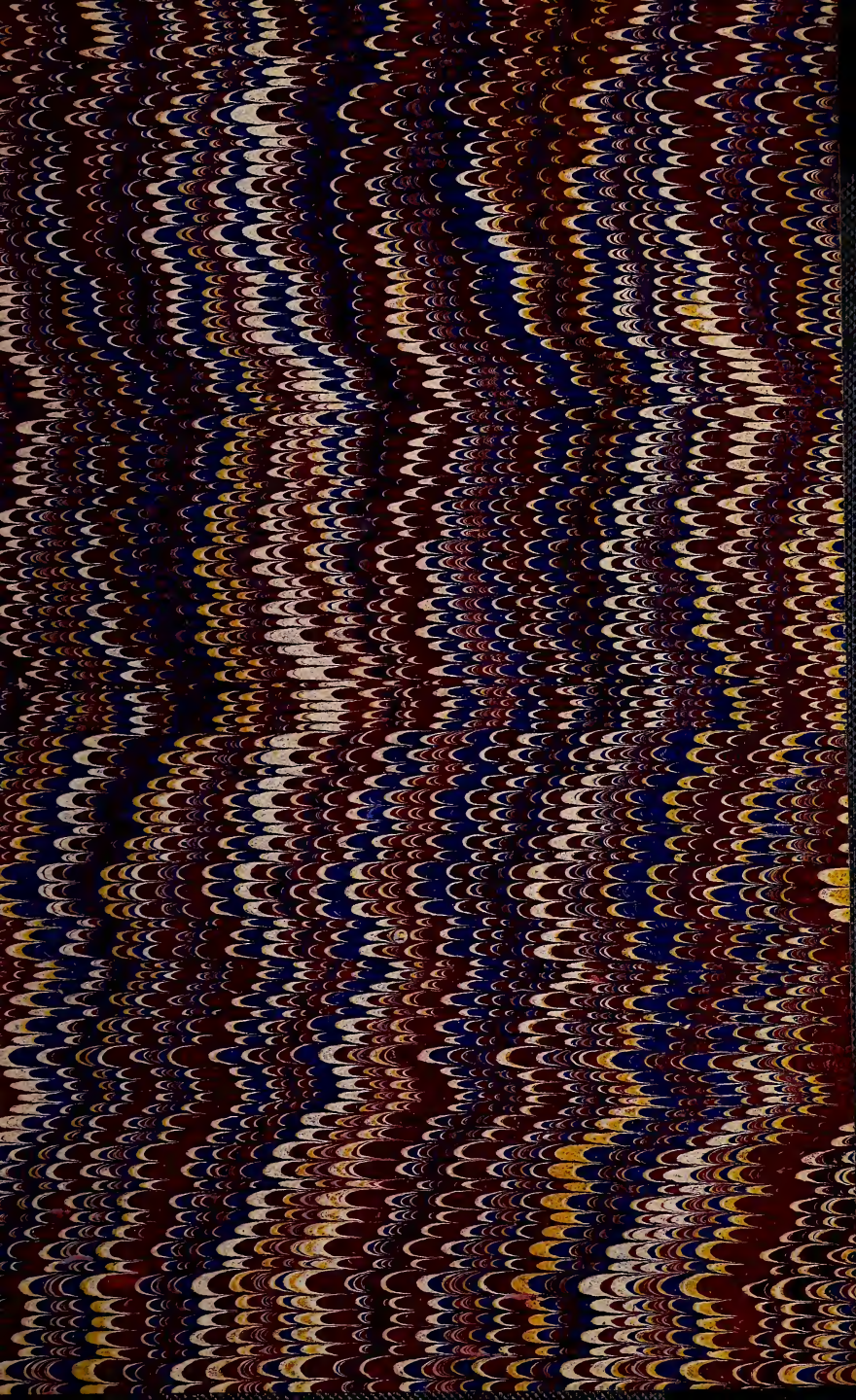














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